THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The purchase of more than 125,000 tons of Bessemer iron for the third quarter by the United States Steel Corporation, at $16 at Valley furnace, is the most significant fact in the week's history. Of this amount 103,000 tons comes from the furnaces of the Bessemer Association. That sales of Bessemer iron have been made in other cases at $16.50 and $16.75, Valley furnace, deliveries extending over the second half of the year, is a double commentary on these steel corporation purchases. It points to the scarcity of Bessemer iron in the second half, already anticipated, and to the concerted effort of the Valley furnacemen and the steel corporation to hold the market within bounds. The necessity for effort to this end has never been so apparent since the present upward movement in iron began, as in the present week. The premiums which buyers of pig iron have been paying in order to secure deliveries in the first half of the year are now transferred to contract transactions for the second half, and steady buying is reported at these figures. The appearance of the stock and production statistics for January has evidently had an influence, but large producers appear to be exerting themselves to hold down the market on foundry iron. The Tennessee Coal, Iron & Railroad Co.'s directors have held in abeyance proposals for an advance beyond $12, Birmingham, for No. 2 foundry, though sales are made by other Southern furnaces at $12.50 and $12.75. On Northern foundry irons there is even more inequality. While $16.50 at furnace is established by a number of Southern and Northern Ohio producers on No. 2 iron, there are still those who sell at $16 at furnace. On the other hand sales are reported this week at $17 at Western Pennsylvania furnace for No. 2, but these were for midsummer deliveries. Gray forge has sold at $16 at Valley furnace. In the Chicago district, Northern irons have advanced fully $1 in the week. Eastern Pennsylvania furnaces have established $16.50 at furnaces as minimum. In all markets buying has been free, Chicago reporting one 8,000-ton sale to an implement works, and Cincinnati transactions include a number of round lots. There has been some talk of the importation of Middlesbrough and Scotch irons, but the basis appears to be recent purchases by London dealers of Cleveland pig iron warrants. These are said to be in anticipation of business from the United States. The steel situation shows further negotiations for the importation of round lots of billets and sheet bars from German and English works. German manfacturers, in view of the American demand and the improvement in their home trade, have advanced their prices, and German billets are now $4 a ton higher than in December. Imported Bessemer billets are now quoted $31.50 at Central Western works. As yet there has been no definite outcome of the second meeting of independent sheet manufacturers, held at Pittsburg on Tuesday, though considerable joint importations of steel are talked of. That United States Steel Corporation companies have not steel sufficient for their requirements appears in the importation of steel by an Eastern mill under contract to furnish angles to the steel corporation on a conversion deal. The chief development in finished material is the pressure from some sources for an advance in structural steel, but the large interests have not yet altered their decision. Business is growing on their books meantime, and some vessel as well as building enterprises have been laid aside because deliveries could not be had. Bars are firm under continued buying, though no large contracts are reported. Prices on sheets, while not uniform, are fairly well maintained in the Central West. Chicago reports some cutting by independent producers.

LATER.—A sale of 4,000 tons of English hematite iron is reported at $19.15, Baltimore. It will probably enter into steel for export. A Philadelphia firm has imported 3,000 tons of No. 3 foundry iron from England at $16.50, delivered, Philadelphia. The meeting of independent sheet manufacturers at Pittsburg is still in session. It is believed a lump order for foreign steel will be placed either through a New York house or through a special agent who will be sent abroad. There is talk of a steel plant and of a blast furnace. Basic iron is very strong at $17.25 to $17.50, Pittsburg. It is learned that there are negotiations for the importation of steel to be converted into wire and nails at a Pennsylvania plant of the American Steel & Wire Co. and re-exported under the drawback proviso.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Feb 19

The pig iron market was further strengthened this week by purchases of Bessemer iron by the United States Steel Corporation for delivery during the third quarter of the year. At a meeting of the Bessemer Pig Iron Association held in Cleveland last Friday the price of Bessemer for delivery during the third quarter of the year was fixed at $16 a ton at the furnace, and the United States Steel Corporation purchased the entire available output of the furnaces for the third quarter, amounting to 103,000 tons. Never before in the history of the iron trade have such large purchases of pig iron been made for third quarter deliveries, during the month of February, and it is another indication of the extreme strength of the market, and its critical condition so far as the raw material supply is concerned. Several furnaces outside of the Bessemer Association have sold Bessemer for delivery during the entire second half amounting to fully 35,000 tons at prices ranging from $16.50 to $16.75 at the furnace, and one furnace in the Valleys, which sold the greater bulk of this iron, is now holding out for $17 at the furnace, for delivery during the latter half of the year, for the remainder of its product. That there will be a shortage of Bessemer iron during the second half of the year is already apparent, not only to the largest steel producer, but to the independent manufacturers, and there is every indication that there will be considerable buying of Bessemer iron for second half delivery during the next few weeks.

Both in foundry and forge irons the market continues extremely firm with an upward tendency. There are inquiries in the hands of pig iron dealers in this district for fully 20,000 tons of foundry iron for delivery in the second half of the year, which will no doubt be placed before the end of the week. Sales of No. 2 foundry have been made during the week for second quarter delivery at $17.80, Pittsburg, and the furnaces are holding out for $17.25 to $17.50, delivered Pittsburg for second half delivery. Forge iron has sold at $16.75 Pittsburg for delivery in the second quarter. The operation of the furnaces in the Valleys continues very bad on account of the failure to secure the proper supply of coke, and it is estimated that the production of the Bessemer furnaces in the Valleys was curtailed fully 7,000 tons during the week on account of banking. The National Steel Co. has also had five of its furnaces banked the greater portion of the past ten days, and the Republic Iron & Steel Co. was also compelled to bank several furnaces.

The banking of the furnaces of course, prevents the shipment of Bessemer iron, and the Ashland Steel Co.'s steel works were idle several days last week, while the Bessemer plant of the Republic Iron & Steel Co., at Youngstown, is not producing its normal output. Several steel plants in the Wheeling district also had their production greatly curtailed on account of the failure to secure prompt shipments of iron.

With the exception of odd lots here and there that accumulate at steel plants practically no domestic steel is to be had, and New York and local importers of German and English steel have been besieged during the week with inquiries and orders or billets and sheet bars. Orders for fully 15,000 tons of foreign sheet bars and billets were placed during the past week by independent mills in Ohio, the Wheeling district and the Western section of this State. In the face of this heavy buying in the foreign markets there has been a further strengthening in the German market and we have been advised that German steel manufacturers, owing to the improved condition of their own market cannot accept any extraordinarily large orders for steel for prompt shipment. Sheet bars and small billets have advanced to the equivalent of $20.81, Antwerp. Add to this a freight rate and duty amounting to $8.05 and the freight rate from seaboard to Pittsburg and it can be seen that these billets cannot be delivered to mills in this district, Wheeling or Youngstown, under $31.50 to $32 per ton. Most of the orders taken during the week for foreign steel was placed at these prices. The English steel makers also promise to figure prominently so far as the importation of steel is concerned as quotations of $32.50 on billets and sheet bars, delivered Pittsburg have been made during the week. Billets are held at $23.37 per ton at Manchester, Eng. We have also been advised that large independent interests are considering the purchase of foreign steel for the entire second half of the year and are now negotiating for a round tonnage. German basic open-hearth billets are quoted at a prohibitory price as they cannot be landed in Pittsburg at less than $34.50 per ton.

The United States Steel Corporation is also indirectly a buyer of foreign billets, as a steel concern in the Eastern part of this state with which the Corporation has a conversion arrangement is importing steel for the manufacture of angles to be delivered to one of the corporation's constituent companies. This would indicate that the corporation is also hard pressed for steel.

The proposition to import 10,000 tons of steel for use at the Allentown, Pa., plant of the American Steel & Wire Co. has also been under advisement by the raw material committee of the big corporation. This steel would be converted into nails, wire, etc., and would again be shipped abroad thus enabling them to take advantage of the drawback. This has never before been done by the United States Steel Corporation. The Southern steel mills are also well sold up far into the second half of the year and many inquiries for large lots are being turned down. We note the sale of 1,000 tons of steel billets for delivery the third quarter of the year at $32, Pittsburg and another sale by this same Southern concern at the same price for the fourth quarter.

Another meeting of the independent sheet interests was held in this city yesterday at which there was a good representation of the independent sheet mills. An adjourned meeting is being held this morning and at this writing is still in session. What the outcome will be can only be conjectured, but it is certain that orders will be placed for a large tonnage of foreign steel, as most of the mills cannot secure their supply otherwise.

In finished lines the market continues extremely strong. None of the large producers of structural material are in a position to make deliveries on new business before August, while the Cambria Steel Co. has notified the trade that it is filled up throughout the entire year. Orders for fully 25,000 tons of structural material were placed by fabricators with mills in this district during the past week.

PIG IRON.—There have been practically no sales of Bessemer iron for prompt shipment during the last week as the furnaces are unable to fill contracts already placed. The merchant furnaces were able to produce but half their regular output on account of frequent bankings due to the shortage of coke and the National Steel Co. and the Republic Iron & Steel Co. were likewise affected. The last week was one of the worst since November and deliveries on Bessemer iron are consequently falling further and further behind. The purchase of 103,000 tons of Bessemer iron for the third quarter of the year, by the United States Steel Corporation, is an indication of the strength of the market, but the price paid, $16 at the furnaces, does not show the Bessemer market's real strength. Sales of fully 35,000 tons of Bessemer were made by furnaces outside of the association at $16.50 to $16.75 per ton, and $17 is now being asked for this delivery. We note the sale of 2,000 tons of forge iron for delivery the second quarter at $16.75, Pittsburg, and the sale of 2,000 tons of No. 2 foundry at $17.80, Pittsburg. For delivery the second half of the year the furnaces are asking $17.25 to $17.50 for No. 2 foundry. We revise quotations as follows:

Bessemer, Valley	$16 00 to 16 75
Bessemer, Pittsburg	16 75 to 17 50
No. 1 Foundry	17 75 to 18 25
No. 2 Foundry	17 25 to 17 50
No. 3 Foundry	16 50 to 17 00
Gray Forge, Pittsburg	16 50 to 16 75
Chilled Basic, Valley	16 25 to 16 50
Chilled Basic, Pittsburg	17 00 to 17 25

STEEL.—We note the sale of 200 tons of open-hearth billets, odd sizes at $32.85, Pittsburg. Bessemer billets cannot be had in this market at the present time. Foreign billets and sheet bars are in demand and are being offered at $31.50 to $32 per ton. This is an advance of nearly $4 per ton in the past two months. We note the sale of 300 tons of Bessemer rods for delivery in the next two months at $35.50 at mill.

FERRO-MANGANESE.—There has been no change in the price of manganese and we quote domestic 80 per cent at $52.50 per ton at buyer's mill. Foreign ferro is held at $50 per ton.

SPELTER.—The spelter market remains practically unchanged and we quote prime Western grades at 4c to 4.02½c, delivered Pittsburg.

MUCK BAR.—While the largest producer is holding muck bar at $30 sales have been reported as low as $29 and $29.50.

SKELP.—We note the sale of 500 tons of grooved steel skelp at 1.70c. Sheared skelp is held at 1.75c while iron skelp is held at 1.80c to 1.85c.

RAILS AND TRACK MATERIAL.—The rail mills continue to operate on orders placed last fall and are not in position to make deliveries on new business before next December. Prices remain unchanged as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $42; 12 pounds, $38; 16 pounds, $35; 20 pounds, $32; 20 pounds, $34; 25 to 40 pounds, $32. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—A fair tonnage continues to be placed in plates and all the plate mills are in full operation. Quotations are unchanged as follows: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carliod lots. Terms, net cash in 30 days.

PIPES AND TUBES.—While independent manufacturers of casing and merchant pipe are cutting prices to secure business the National Tube Co. is maintaining discounts, and is securing what is considered an immense tonnage for this season of the year. Discounts to consumers in carload lots are as follows:

MERCHANT PIPE.

	Blk. Per cent.	Galvd. Per cent.
⅛ to ⅜ and 11 to 12 inches	61	48
½ to 10 inches	68½	56

BOILER TUBES.

Steel.

	Per cent.
1 to 1⅜ inches	47½
2¼ to 5 inches	65½
1¾ to 2¼ and 6 to 13 inches	60

Iron.

	Per cent.
1 to 1⅜ and 2½ inches	43½
1¾ to 2¼ inches	43
2¾ to 13 inches	53

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12¾ inches	65

BARS.—None of the steel bar manufacturers can promise deliveries in less than 90 days and on prompt deliveries some are securing premiums. The steel bar manufacturers have promulgated the following schedule of prices on small lots: On lots of one size of either Bessemer or open-hearth, aggregating 1,000 pounds to 1999 pounds inclusive an advance of 5 cents per 100 pounds is made; one size aggregating over 500 pounds to 999 pounds inclusive, an advance of 15 cents per 100 pounds; one-size lots aggregating 500 pounds or less an advance of 25 cents per 100 pounds. These advances are in addition to the half extras charged. Our regular quotations follow: Iron bars 1.60c, Pittsburg, with full freight added to point of delivery; refined iron bars, 1.75c and upwards; Bessemer steel bars, 1.50c; open-hearth, 1.60c; plow beams and cultivator beams, 1.50c, net; channels, angles, zees and tees, Bessemer under three inches, 1.60c; over 3 inches, 1.70c. Hoops and bands are quoted at 1.90c, full extras.

SHEETS.—The demand for black sheets continues strong and all the independent mills as well as the American Sheet Steel Co. are securing sufficient business to keep their mills in full operation. The independent manufacturers are not only securing the prices quoted by the American Sheet Steel Co. but in many cases slight advances. On galvanized sheets concessions are being made by the independent mills to secure business, but thus far they are not more than 2½ per cent. We make the following quotations: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25 to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets are quoted at 70 and 5, and 75 off in carload lots; less than carload lots, 70 and 10 and 5 off.

STRUCTURAL MATERIAL.—Fabricators placed contracts with structural mills in this district amounting to fully 25,000 tons during the past week. The Cambria Steel Co., a large producer of structural material, is not taking further orders for delivery this year, the books already being filled up, while the Carnegie Steel Co. and Jones & Laughlins, Ltd., cannot make deliveries on new business in less than six months. There is a great scarcity of all sizes of angles while beams and channels up to 10 inches are also very scarce. Prices are unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—The recent advances in wire and wire nails have stimulated demand and a large amount of business is being closed by both the American Steel & Wire Co. and the independent manufacturers. A fair demand also continues for cut nails. We continue the following quotations: Wire nails in carload lots are quoted at $2.05 per keg, while smaller lots are held at $2.10 and $2.15; plain wire $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire $2.40 in carload lots; polished staples $2.20 and galvanized staples $2.60; painted barb wire $2.60 and galvanized $2.90. These prices are quoted on a Pittsburg base plus the actual freight to destination. Cut nails are held at $1.95 in carload lots and $2 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—The recent advance in shafting has resulted in bringing in considerable business and the manufacturers report business for fully three months now on their books. There is little danger of the shafting agreement entered into two weeks ago being broken, as large forefeits have been posted by all the manufacturers. We make the following quotations: Turned, cold rolled and ground shafting in carload lots 55 off, and in less than carload lots 50 off: tire steel, 1.70c in carload lots and 1.80c less than carload lots; toe calk 1.95c to 2.05c; sleigh shoe, 2c to 2.25c; machinery steel, 1.50c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—We note the sale of 500 tons of crop ends at $23 per ton, Pittsburg. Rerolling steel rails are held at $24 per ton while relaying rails are commanding $26 and $27 per ton. Our quotations, gross tons, are as follows: Heavy melting stock, $17.50 to $17.75; steel rails, $17 to $17.25; bushcling scrap, $13.50 to $14; No. 1 wrought, $18 to $18.50; iron rails, $22.50 to $23; cast borings, $9 to $9.25; cast scrap, $15.75 to $16.

COKE.—Furnace coke for prompt shipment is commanding $2.75 and $3 per ton, while foundry coke is selling as high as $2.75 per ton. On running contracts Connellsville coke is held at $2.25 for furnace coke and $2.50 for foundry. Outside coke is about 25 cents per ton less. The coke production continues to hover about 210,000 tons for its weekly production and for the week ending Saturday, Feb. 8, amounted to several hundred tons more than this figure. It is estimated that fully one week's production is stacked in the Connellsville region, and in many cases it is hampering the proper operation of the coke ovens, restricting production.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
934 MONADNOCK BLOCK, Feb 18.

The firmness of the local market, both in pig iron and finished product, is emphasized with each week. It is impossible to secure delivery on pig iron of any grade within six months, and the same is true with regard to those lines of finished product which are more generally called for. Never in the history of the trade has there been such a scarcity of material as prevails today, notwithstanding that the productive capacity of this territory has grown considerably in the past few years. While this result is due in a measure to the fuel scarcity, which for several months so seriously curtailed manufacturing operations, it is largely the result of the unparalleled trade activity in all lines where iron and steel are consumed. Manufacturers are a unit, however, in desiring to keep prices down, and while the cost of material out of stock has kept pace with the growing demand and scarcity, only on pig iron and bars have manufacturers' prices been advanced since the first of the year. In this time, local No. 2 foundry has advanced from $15.50 to $17.50, and bars from 1.65c to 1.75c. Manufacturers, if they desired, could easily get better prices for their material than those quoted, but have generally refused to take advantage of the opportunity, and as far as possible have endeavored to fill the wants of customers at the regular quotations.

The scarcity of material in this market may be judged from the fact that structural mills are from sixty days to six months behind in deliveries, and two of the largest manufacturers have notified their local offices to take no more orders for certain light sections for delivery within six months, and on others the mills are filled for nine months. Warehouse stocks of this material amount to practically nothing, and only on heavy sections of beams can reasonable delivery be guaranteed. Sheet mills also have been seriously delayed in getting out material, and are two to three months behind in shipments. All the local bar iron manufacturers report they are sold ahead for three and four months, while the local steel interest has been for several weeks out of the market. Occasionally, a few tons of billets are sold in this market, but for some time mills have declined to make any quotations, needing all the material they can manufacture. There has been active buying in the past week, all for delivery in the last half. There is no improvement in the shipments of coke, and furnacemen and foundrymen are again facing the problem of getting fuel or shutting down. Spot coke has advanced to $6.25, and at this price is hard to get. The scrap market is firm, and all consumers are active buyers.

PIG IRON.—Sales in the past week, while not as heavy as in the week previous, have been fairly numerous, mostly for lots below 1,000 tons, and for deliveries scattered through the latter half of the year. Among contracts placed in the week was one from a local agricultural implement concern for about 8,000 tons. We have advanced our prices of Northern irons this week from $1 to $1.50 a ton. This advance has been paid for some time in the shape of premiums for prompt delivery, but so great has been the demand for iron that manufacturers have experienced no difficulty in getting the same on contracts for delivery in the last half. Southern furnaces are now talking of advancing prices, and it is quite possible a formal increase of 50 cents to $1 a ton will go into effect this week. The furnace at the Union Works, Chicago, which since it was blown in some weeks ago has been manufacturing Bessemer iron, will be changed to spiegel this week, and the remaining idle furnace at these works will be blown in on Bessemer. The furnace at the North Works, which is being relined, will also shortly be blown in on spiegel. We quote as follows:

Lake Sup. Charcoal...	$20 00 to $21 00	Southern No. 1 Soft...	$16 15 to 16 40
Local Coke Fdy. No.1	17 50 to 18 00	Southern No. 2 Soft...	15 55 to 15 90
Local Coke Fdy. No.2	17 00 to 17 50	Southern Gray Forge	14 65 to 14 90
Local Coke Fdy. No.3	16 50 to 17 00	Southern Silveries.....	16 65 to 17 65
LocalScotchFdy.No.1	18 50 to 19 00	Jackson Co. Silveries	17 00 to 17 50
LocalScotchFdy.No.2	18 00 to 18 50	OhioStrong Softeners	17 50 to 18 00
Southern Coke No. 1	16 40 to 16 65	Alabama Car Wheel...	20 50 to 21 00
Southern Coke No. 2	15 65 to 15 90	Malleable Bessemer..	18 00 to 18 50
Southern Coke No. 3	15 15 to 15 40	Coke Bessemer.....	18 50 to 20 00
Southern Coke No. 4,	14 65 to $14 90		

BARS.—There is no change to be noted from the report of last week. All the mills report buying very active, and that specifications on contracts are heavy. The local mills are sold ahead for three and four months and new business is for delivery in the last half. We quote iron, 1.75c to 1.85c, Chicago; steel, 1.65c to 1.75c, Chicago; out of store, 2c.

SHEETS.—Independent mills are actively seeking business in this market and are cutting prices to get it. Jobbers report that buying has fallen off some, and that mills are several weeks behind in shipments. We quote No. 27 black from store, 3.30c to 3.40c, and galvanized 70 per cent to 70 and 5 per cent.

STRUCTURAL STEEL.—There is little new business in this market, for the reason that two of the largest manufacturers are refusing to take more orders. All the mills are sixty days to six months behind in shipments, and only on a few sizes of heavy sections of beams, can reasonable delivery be guaranteed. An evidence of the scarcity of material is the fact that the American Bridge Co. tried to place a large order for 4-inch channels in this city and offered a handsome price but could not get the material. Stocks in warehouses and yards amount to practically nothing. We quote mill shipments, carload lots, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; angles, 6x6 and under, 1.75c; over 6x6, 1.85c; plates, 1.75c; base, tees, 1.80c; zees, 1.75c; lots from store, angles, 2.10c, minimum; tees, 2.15c, minimum; beams and channels, 2¼ cents per pound, minimum.

RAILS AND TRACK SUPPLIES.—There is a fair inquiry for standard weight rails, but not as much as it was a few weeks ago, owing to the inability of mills to make early deliveries. Track supplies are in excellent demand, but mills cannot make shipments on new business in three or four months. We quote as follows: Standard rails, $28; light sections, $34 to $36, according to size; out of store, $40 to $44; splice bars, 1.70c to 1.80c; spikes, 2.10c; track bolts and hexagon nuts, 2.80c to 2.90c, out of store, 2.90c to 3c; square nuts, base, 2.65c to 2.75c; out of store, 2.75c to 2.85c.

MERCHANT STEEL.—Some contracts for fair amounts have been placed during the past week, mostly for the second and third quarters of the year, which is the range of possible delivery by mills. Prices continue firm. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c, which can be shaded on carload lots; open hearth spring steel, 2.25c to 2.50c; sleigh shoe, 1.65c to 1.80c, flat sizes; concave and convex, 2c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 2.40c to 2.60c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 per cent to 10 per cent higher; cold rolled shafting, carload lots, 55c off, Chicago; less than carload lots, 50 per cent off, Chicago.

BILLETS.—There is a good demand for billets in this market, though it is almost impossible to get them, several mills declining to make any quotations. Mills that have any for sale find no difficulty in getting almost any price they chose to ask. We continue to quote Bessemer billets, $31 to $33; open hearth, $33 to $35.

PLATES.—The local interest reports that buying is much improved, and that several good sized orders have been closed in the past week. Fairly prompt delivery can still be secured, however. Jobbers also report a brisk demand. Our quotations follow: Tank steel, base, ¼-inch, 1.75c to 1.85c; flange steel, 1.90c to 2c; marine steel, 1.95c to 2.10c; firebox steel, ordinary, 2c to 2.10c; special, 2.25c and upward. Jobbers are selling from store according to size as follows: Tank steel, 1.90c to 2c; flange steel, 2.10c to 2.25c; marine steel, 2.40c to 2.50c; firebox steel, ordinary, 2.40c to 2.50c; special, 2.50c and upward.

CAST IRON PIPE.—Buyers of this material do not as a rule come into the market before spring is well advanced, and while there is a healthy inquiry, actual sales are not large or numerous. Prices are firm. We quote as follows: 4-inch water pipe, $29; carload lots, f. o. b. Chicago; 6-inch water pipe, $28; 8-inch and larger sizes, $27; gas pipe, $1 per ton higher than above prices.

MERCHANT PIPE.—The same conditions as govern the buying of cast iron pipe apply in a measure to the purchase of this material. Inquiry improves as spring advances, but a buying movement of any consequence will not be felt for several weeks. Our quotations follow:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
¼ to ⅜ and 11 to 12 in.	59.5	46.5
½ to 10 inches	67	54.5

BOILER TUBES.

	Steel Per cent.	Iron Per Cent.
1 to 1½ in.	40	35
1¾ to 2¼ in.	47½	37½
2¾ to 5 in.	57½	47½
6 in. and larger	45	40

WIRE AND WIRE NAILS.—The local interest reports that all its mills are running to their full capacity, and that the product goes immediately into consumption. Neither manufacturers nor jobbers have been able to accumulate any stocks. The present indications are that the spring trade this year will be heavier than for several years past. We quote prices as follows: Smooth wire, carload lots, $2.15; painted barb wire, $2.75; galvanized barb wire, in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents for less than carloads.

COKE.—Receipts have fallen to a point almost as low as they were several weeks ago, and some furnaces will be compelled to shut down unless there is an improvement this week. Spot coke now brings $6.25, while for future delivery, $5 is the ruling quotation.

OLD MATERIAL.—The present condition of the pig iron and bar iron market is responsible for the firm and increased prices for scrap. Mills are not buying heavily at the present time, waiting for prices to go lower, but other consumers are covering for their needs, and sales in the past week have been large. We revise some of our prices, and quote as follows:

Old iron rails	$21 50 to $22 50	Relaying rails	27 00 to 28 00
Old steel rails, 5 ft. and up	22 50 to 23 00	Old wheels	$17 00 to $17 50
Old steel rails, mixed	14 50 to 15 00	Heavy melting steel..	14 50 to 15 00
		Mixed country steel..	10 50 to 11 00

The following are selling prices per net ton:

No. 1 R. R. wrought...	$16 00 to $16 50	Steel Axles	$18 50 to $19 00
No. 2 R. R. wrought...	14 00 to 14 50	Cast borings	6 50 to 7 00
Dealers' forge	13 50 to 14 00	Wrought turnings	11 00 to 11 50
No. 1 busheling	11 00 to 11 50	Iron axle turnings	12 00 to 12 50
No. 1 R. R. & mach. cst.	12 25 to 12 75	Steel axle turnings	12 00 to 12 50
Railway malleable	12 00 to 12 50	Stove plates	10 00 to 10 50
Country malleable	11 50 to 12 00	Old iron splice bars	16 50 to 17 00
Iron axles	21 50 to 22 00		

CLEVELAND

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Feb. 19.

Chartering by certain ore shippers has been the feature of the past week in iron ore circles. As indicated in this column recently, there is a disposition on the part of some shippers to leave more ore uncovered than in other years, in view of the increased supply of tonnage and the absence of any special interest by the steel corporation in the maintenance of rates. One large shipper has made 75-cent offers for Duluth tonnage, taking the same position as the steel corporation, but no 75-cent business is reported. Above 2,000,000 tons has been taken at 80 cents, which would make the Marquette rate 70 cents and the Escanaba rate 60 cents.

Ore sales are slow as compared with a few weeks ago. Sellers having a good proportion of their ores taken on term contracts are now pretty well through with 1902 sales. There remains a very considerable tonnage of Mesabi ores to be sold, both in Bessemer and non-Bessemer grades, and on the old ranges scattering lots of Bessemer and non-Bessemer. The ore movement from docks to furnaces has been much hampered this winter. Southern Ohio furnaces for example, which were unable to get much ore forward for stocking in the season of navigation, are now running almost from hand to mouth.

PIG IRON.—The United States Steel Corporation companies are reported to have purchased so much of the Bessemer out of the association furnaces as was offered for the third quarter, at $16.00 Valley furiace. As to foundry iron there is a difference in quotations. Some furnaces, in the evident effort

to keep things within bounds and to prevent an ultimately reactionary market are selling No. 2 foundry at $16 at furnace for delivery in the second half. There are others asking 50 and 75 cents above this figure, and one sale of 500 tons July delivery is reported at $17 at furnace. The makers find an occasional foundryman who is engaging more iron than he has consumed heretofore in an equal time, but there is very little speculative buying considering the volume of current business. Furnaces have been further hindered in the past week by the failure of coke to reach them in time to prevent banking. It is a question how much the improvement amounts to, that was talked about after the turn of the year. A number of Valley furnaces were banked early this week, the snows of the past week making serious trouble. Word from the coke regions is that the situation is liable to be even worse. The furnaces are much behind in deliveries and there is little chance of their catching up before the third quarter. Southern sellers of iron are getting higher prices without formal announcement of advances, though the leading producer there is still naming $12 Birmingham on No. 2. Gray forge iron is very scarce at $15.75 at Valley furnace. A sale has been made at $16.50 Pittsburg. We quote basic at $16.25 Valley furnace. The Cleveland market follows:

Bessemer	$16 75 to $17 50	Scotch No. 1	$17 25 to $17 75
No. 1 Strong F'dry	17 25 to 17 75	Scotch No. 2	16 75 to 17 25
No. 2 Strong F'dry	16 75 to 17 25	Gray forge, Valley	15 75 to 16 00
No. 3 Foundry	16 50 to 16 75	Lake Superior charc'l	20 00 to 21 00

FINISHED MATERIAL.—Activity continues in all lines not affected by the winter season, wrought pipe and light gages of sheets being quiet. The business in bars holds up well. Agricultural implement manufacturers are of course not in the market for new contracts, but they are specifying heavily and are crowding the mills for deliveries. There is no difficulty in getting a premium for prompt or reasonably early deliveries, and on mill shipments 1.65c Pittsburg has been obtained for bar iron, though 1.60c is the basis generally. Producers are not pressing for business there being a feeling in some quarters that spring and mid-year business may bring higher prices. Scrap and labor cost are both higher, and at the present price for muck bar there is no profit in all-muck iron. Considerable business in steel bars is pending locally. Bars for structural work are in special demand, and the American Bridge Co. is scouring the country for angles above 3 inches, its work being hindered by scarcity, and good premiums are being offered. The supply of small angles is now more equal to the demand. Several thousand tons of structural steel are under inquiry in this market. One mill has given notice that it cannot take on more business for this year; in other cases July or August delivery is the earliest. There is a growing sentiment among some of the mills in favor of an advance. A shipbuilding contract for 3,000 tons of plates is up and there is some boiler plate demand. Prices and deliveries are as before, the former at 1.70c Cleveland for tank, while deliveries can be made in three or four weeks. More plates could be sold for shipbuilding and structural work could the shapes be had within the next three or four months. The sheet trade shows preparation for the active season, and some sellers are not making the concessions they were willing to grant a few weeks ago. Independent manufacturers who have arranged for a supply of steel are aggressive in the market for business; some others on account of the uncertainty about raw material are unable to take business far ahead. There is thus a certain irregularity in prices. We quote on mill shipments to consumers, Cleveland deliveries, as follows: No. 24, 2.50c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c, with usual extras for less than carload lots, etc. Quotations from store are as follows, prices depending on quantity and delivery; No. 10 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.05c to 3.10c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 25-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c. The above are for one pass through cold rolls. For full cold rolled the extra is .10c. Galvanized sheets are quoted 70 to 70 and 5 off list.

OLD MATERIAL.—The advanced prices of a week ago are maintained and the market is decidedly stiff. The scarcity of material has led some of the smaller dealers to hold for a further rise. Current prices, however, have not advanced beyond those given in out last issue, which are repeated, all in gross tons, as follows:

Old steel rails, rolling mill lengths	$17 50 to 18 50
Old steel rails, short lengths	16 00 to 17 00
Iron rails	21 00 to 22 00
No. 1. railroad wrought	17 50 to 19 00
Mill scrap	15 00 to 16 50
No. 1. machine scrap	14 75 to 15 50
Machine shop turnings	13 00 to 13 50
Cast borings	7 00 to 7 50
Grate bars	8 50 to 9 00
Sheet iron	9 00 to 10 00
Stove plate	10 00 to 10 50
Car wheels	16 00 to 17 00
Heavy steel scrap	16 50

CINCINNATI.

Feb. 19.

It is still the efforts of producers of pig iron and the producers of finished material to keep prices from advancing. In the case of finished material this has been so manifest that it has had the desired effect on buyers, at least in a measure. Orders for material have, of course, been pouring in and manufacturers are still unable to get any nearer to satisfactory deliveries. But there is no doubt that buyers have been in a way impressed with the idea that they can buy after a while at about the same prices, on the theory that the large combinations are able to maintain an average price, or a fair price, as well against an undue advance as against an undue decline. However, the pressure is greater with each week.

Pig iron is similarly situated, though there is not the same strength behind the producers of pig iron in the way of concentration of forces as in the case of the manufacturers of finished material. It is the general feeling, however, that the price of pig iron is about high enough and unless the buyers actually run away with the market as they did once before there will stable prices for some time longer.

All branches of the iron trade are busy. Furnaces are producing more than they ever did. Rolling mills and manufacturers of different kinds of material are far behind their orders, and foundries are sold well along in the year. The consumers of material of all kinds are full of business; the weather conditions giving confidence to manufacturers of implements, tools and vehicles that there will be good crops and good business. The demand for the products of these manufacturers is generally good. Machine tool builders report a continued good demand at home and also an improvement in the inquiry from abroad.

PIG IRON.—The demand keeps up without any noticeable abatement. The aggregate of orders for the first half of the year is now estimated to be in advance of the indicated production although production is heavier than it has ever been. With the decrease of stocks and the sale on contracts of all the producing capacity of most of the furnaces during the first half the concern that has to have iron on short notice is compelled to pay a premium. Not only is this true, but in most cases a different grade of iron is bought than was asked for. Purchasers are also rather careless about whether the iron delivered is up to grade or not. They are glad to get whatever they can find, and if they can get any iron short of the middle of the year it savors of a miracle of the cruse of oil kind.

The orders for iron placed during the past week have been distributed well through the list, though there have been several large orders placed for foundry iron of different grades for delivery well on toward the end of the year. One notable order was for 12,000 tons of foundry grades. Another was for 10,000 tons, largely of foundry grades, and there were several orders for 5,000 tons. The buying has been unusually heavy during the week and it has been with unusual effort on the part of the large Southern companies that the price has been kept at a level of $12 for No. 2 foundry at Birmingham. Some sellers are getting $12.50 and $12.75. If the price is advanced, the large producers say it will be the doing of the buyers and the irresistible momentum of the market itself. Following are prices f. o. b. Cincinnati:

Southern Fdy. No. 1	$15 25 to $15 75	Gray Forge	$13 75 to $14 25
" " 2	14 75 to 15 25	Northern Fdy. No. 1	17 85 to 18 35
" " 3	14 25 to 14 75	" " 2	17 35 to 17 85
" " 4	13 75 to 14 25	Southern C.W. iron	19 50 to 20 00
So. Fdy. No 1 soft	15 25 to 15 75	Malleable coke iron	17 60 to 18 10
So Fdy. No. 2 soft	14 75 to 15 25		

FINISHED MATERIAL.—The demand for bar iron is immense and bar steel is in the same demand. Deliveries are still such that concerns in need of material have to make the fact known long before they actually have to have it. Buying

[Continued on page 26.]

THE IRON TRADE REVIEW

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FEBRUARY 20, 1902.

THE IRON TRADE ON THE DANGER LINE.

It is a question if deprecation on paper of boom tendencies is an adequate preventive, yet some features of the present situation in iron have been improperly characterized and call for comment. It has been said over and over in daily newspaper articles that a famine exists in pig iron, in steel, in structural material, and so on. The ground for these statements was the breaking down of the transportation facilities of the country under the heavy load which prosperity had put upon them. Since early November the situation has been serious, with alternation of relief and relapse. Today so far as the blast furnaces are concerned, particularly those in Central territory which produce more than two-thirds of the pig iron of the country, there is no better assurance of steady operation than they had in November, though January showed a larger production than December. In the matter of freight out of finishing mills the embargo of December was relieved somewhat in January, but there are still tens of thousands of tons of finished material piled up at mills, that cannot be hauled away, because there are not engines and cars to carry it.

Meantime locomotive works and car shops are turning out rolling stock at a rate never equaled—fully 12,000 cars a month in shops apart from those of the railroads and more than 175 locomotives a month; so that some mitigation of present troubles is ahead, even though it be gradual in operation. But in spite of all drawbacks from insufficient coke supply the blast furnaces of the country produced 1,458,483 tons in January, according to the figures of the Western Pig Iron Association, or at the rate of 17,500,000 tons a year. In 1901, which was unprecedented in the volume of iron and steel consumption, our apparent consumption was 16,231,829 tons (production, 15,878,354 tons; stock reduction, 371,723 tons; imports, 62,930 tons, and exports, 81,178 tons). Thus, with the interruptions of January there was produced more than 100,000 tons above the average consumption in 1901. Consumption in January still outran this production, the report of stocks on hand showing a decline from 217,023 Jan. 1 to 158,383 tons Feb. 1.

There is already evidence that this remarkable showing of the demand for iron has led some buyers to make contracts into which the precautionary element element enters largely. The fact that furnaces are behind scheduled deliveries has led a minority of consumers to buy as they did in 1899, principally with a view to making sure of deliveries. Producers are doing all that they can to discourage such buying, and it is not yet a factor of importance. But the practical point is that if the famine talk is given credence, it may lead to competition among buyers to get places on the furnace companies' delivery schedules, the payment of premiums for guaranteed deliveries, and eventually to a runaway market that will certainly bring disaster to the whole industry.

Foundry iron, in which there is an open field and for which the demand comes from a multitude of widely diverse sources, is a better barometer of general conditions than any department of the finished steel market. And it is with a view to securing stability in this trade that the leading Southern producer has refused to put up its price, although other sellers are getting $12.50 and $12.75 at furnace for Southern No. 2 foundry. In the Bessemer pig iron market the furnacemen have acted with like conservatism in disposing of the bulk of their product at $16 at furnace for third quarter delivery, though $16.50 and $16.75 have been paid for similar delivery, and No. 2 foundry has sold at $16.50 and as high as $17 at furnace. In the finished material market the action of the leading interest in holding prices is well known. Premiums could have been had on rails after it became evident that three-fourths of the capacity of the mills for 1902 was taken. The action on bars is well known. Structural material is now under pressure, in view of the advances made by Eastern mills.

It is not philanthropy that leads to the refusal of producers to name higher prices. The material could be sold at the advance and profits would be that much increased. But there is a very wholesome fear of the penalties of high prices. The experience of 1900 ought to be sufficiently fresh in mind to act healthfully on the market; but there will be two classes, as always under like conditions—those who are governed by a long look ahead and those who act on the principle that the time to make a profit is when it can be had and who believe that when demand makes the price, whatever the figure, it is legitimately secured.

The thing that most needs emphasizing now is that in 1899 demand did not make the price; but buyers' fears and speculations and competitions one against another for deliveries they did not know they needed, and which the event proved they did not want, did make the price. This ground is all so familiar that it may appear superfluous to go over it again. But the fact appears more prominently this week than it appeared last week, that the iron famine talk can only result in harm, and it behooves every man in the trade, for his own and his neighbor's good, to talk and act against it. Production is increasing and can increase on today's level of prices. Every 25-cent advance now may be loaded for a dollar's worth of harm when the turn from the top figure comes.

UNION RESTRICTION IN MACHINE SHOPS

Elsewhere in this issue we print the agreement that is to be entered into in Great Britain between the manufactures of machinery and the machinists' unions. It is the successor of the agreement that ended the engineers' strike, and as it was drawn up on the initiative of the unions it is expected to be ratified. It will be read with interest by machine shop employers in the United States, many of whom will be surprised to note that with all that is said of the oppressive restrictions of trades unions in England, here is an agreement that is more liberal than union machinists in the United States are willing to sign. The right of the proprietor to employ non-union men is granted, in contrast with the repudiation of the New York agreement by the International Association of Machinists because it contained such a proviso. More recently at Chicago

the union machinists demanded as a condition of the termination of the Allis-Chalmers strike that every man now in the employ of the company be discharged.

A very real factor in the future of our foreign trade in all manufacturing lines is the British manufacturer's awakening to the peril in which his former subservience to false unionism has put him. The agitation in England on this subject is coming to some practical outcome. Manufacturers in the United States will certainly not allow themselves to be put in the straight-jacket of limited output and of union-controlled shops just as their competitors in Great Britain are throwing it off. Commenting on the situation as traversed by recent newspaper articles London *Engineering* pertinently says:

We are free to acknowledge that all the faults are not on one side, and all the virtues on the other. There have been employers who have justified the hostile attitude of trade unions; and even amongst those who have not been of the extreme section there has been too often a disposition to cut prices for piecework when men have been making high wages by extra exertion. Such conduct naturally calls forth reprisals on the part of the men; but reprisals, even when justified, are dangerous. In the present case there is danger that whilst masters and men are struggling at the gate, another is reaping the harvest. That is a very real danger just now; so it would be well to forget reprisals, each side striving its best, first, to secure the crop, and then, if this is done honestly, there will be enough to reward each according to his deserts, though, perhaps, not according to his aspirations.

But though it is bad to quarrel, it may be worse to give way; war is better than an ignominious peace, industrially or politically. A business, like a state, needs to be ruled by a responsible government. Now, it is evident that a trades-union council, either by written or unwritten laws, cannot successfully control all the manufacturing establishments within its scope. If it says "Only these men shall be employed, and they shall work only under such-and-such restrictions," that alone may be enough to paralyze an industry—may kill the goose that lays the eggs—not golden, perhaps, for the workman, but wholesome food. The state of society has yet to be evolved in which all shall be rewarded alike.

We are addressing engineers; are writing in the interests of both masters and men. Our desire is to preserve British engineering industry, for which the prosperity of both capital and labor are essential. We need not tell again the way in which output has been restricted; no proof is needed; both sides have learnt the story by experience. But it may be more difficult for some to understand how the restriction of product, the fantastic rule of socialistic and militant trade unionism is a danger to prosperity; even fatal to civilization.

If we are to hold our own, that rule must be broken. * * * * If the engineering employers of this country would retain their ancient prestige, they have now a heavier task than has ever yet been set them by fate. Hitherto they have had matters much their own way; up to recent times foreign competition has been almost a negligible quantity. Those pleasant, easy days are past. Whatever statistics may show, there is much leeway to make up. We must needs put our house in order. All classes—masters and men—must do their best if they would make secure the great common interest of all—the chief material benefit of any nation—a flourishing manufacturing industry.

United States Steel Corporation.

At the first annual meeting of the stockholders of the United States Steel Corporation, held at the New Jersey office of the corporation in Hoboken, Feb. 17, there were present about 30 persons, and 76 per cent of the total stock was represented personally or by proxies. Judge E. H. Gary presided. The date of the annual meeting was changed from February to April, and the fiscal year was made to correspond with the calendar year. The acts of the management, including the agreement with the Morgan syndicate, were approved. The following directors of class 1, whose terms expired, were re-elected: Marshall Field, Daniel G. Reid, John D. Rockefeller, Jr., Alfred Clifford, William E. Dodge, Nathaniel Thayer, Abram S. Hewitt and Clement A. Griscom. The election of the directors of the other two classes was ratified as follows: Class 2, for two years, ending 1903: Francis H. Peabody, Charles Steele, William H. Moore, Norman B. Ream, Peter A. B. Widener, James H. Reed, Henry C. Frick and William Edenborn. Class C, for three years, ending in 1904: J. Pierpont Morgan, John D. Rockefeller, Henry H. Rogers, Charles M. Schwab, Elbert H. Gary, George W. Perkins, Edmund C. Converse and Percival Roberts, Jr.

The syndicate managers of the United States Steel Corporation have declared a first dividend of 5 per cent, or $10,000,000, on the amount of $200,000,000, for which the underwriting syndicate was formed. Of the $200,000,000 for which the syndicate has made itself liable, only 12½ per cent, or $25,000,000, was ever called.

Freight Rate on Blast Furnace Slag.

PITTSBURG, Feb. 19.—(Special Telegram).—The tariff rate of 15 cents per ton on slag and refuse to be hauled from furnaces in the Mahoning and Shenango Valleys will not now become effective until Oct. 1. At a meeting of the Eastern Ohio and Western Pennsylvania Freight Traffic Association, held here this week, it was decided to postpone again the date for making the tariff effective. It was originally decided to enforce it on Jan. 1, but the date was later postponed to Feb. 15. The furnacemen argue that they should not be compelled to pay any tariff on this material, inasmuch as it is used to good advantage by the railroads.

Further Sales of Bessemer Iron at $16.

PITTSBURG, Feb. 19.—(Special Telegram.)—The United States Steel Corporation is now buying practically all the Bessemer iron that is being offered at $16 at the furnace, and it is probable that fully 30,000 tons, in addition to the tonnage already purchased, will be closed before the end of the week. Several furnaces outside of the Bessemer Association feel disposed to hold their iron for the third quarter at $16 per ton, despite the fact that sales have been made above this price. They argue that there is a fair profit for the furnaceman at this price, and in addition the market will be held within bounds.

A Three-Turn Day at Blast Furnaces.

It is announced that the blast furnace workers of the Mahoning and Shenango valleys and all other districts embraced in the organization of the Blast Furnace Workers' Association of the United States, will make a demand for an eight-hour turn, or three shifts of eight hours each. At present all are working two turns of twelve hours each. A meeting of the executive board and vice presidents of the association will be held in Youngstown next Monday. The movement is to include a number of furnaces of the United States Steel Corporation, which heretofore were not included in any of the demands made.

The Dominion Iron & Steel Co., of Sydney, Cape Breton, has a rail mill under construction and expects to complete it this year. It will be a 22-inch three-stand mill for rails 70 pounds and under, and is calculated for blooms 7x7 inches by 10 feet. The mill equipment recently contracted for includes two heating furnaces, conveyors and hot beds.

Charles E. Stamp & Co., New England Bldg., Cleveland, have been appointed sales agents of the Milwaukee Electric Co. for the district of Northeastern Ohio, E. H. Monasmith being in charge of the electrical department.

The Titusville Iron Co., Titusville, Pa., handed each of its employes an envelope on St. Valentine's Day. Enclosed was a check, the employe in each case receiving 5 per cent on the wages he had earned in 1901. A printed slip informed him that this was in recognition of faithful service. About 225 employes—boiler makers, machinists, molders and blacksmiths—were recipients of these checks.

Joseph T. Ryerson & Son, iron and steel merchants, Chicago, has established offices in New York at 22 and 24 State street, foot of Broadway. These will be in charge of W. R. Garberson, with W. T. Bonner as associate.

CINCINNATI MARKET.

[Continued from page 23.]

is on a large scale and manufacturers of various lines are in the market for good lots. Agricultural implement manufacturers are buyers of large amounts, after having held off during the latter part of the year and the first of the new year. The long period that snow has covered the ground has encouraged the agriculturalist in the belief that the crops will be large and this means a good business for the implement makers.

Tool builders, car builders, boiler makers and, in fact, all lines are liberal buyers on the strength of their own good business. In line with the policy of not advancing prices the figures on finished material remain the same. Bar iron is 1.72c at Cincinnati and bar steel, 1.62c. Angles are 2c; plates, 1.85c; sheets, No. 28, 3.35 to 3.40c; No. 12 blue annealed, 2.35c.

Old Material.—The prices of scrap iron remain about the same with a good demand on the part of melters who find that they cannot get pig iron on quick delivery. The market is moderately active and prices are as follows:

Old No 1. Wrought Railroad, net tons	$ 15 50 to 16 00
Cast Machine and Foundry, net tons	12 50 to 12 75
Old Iron Rails, gross tons	21 25 to 21 50
Old Steel Rails, gross tons	18 00 to 18 25
Old Short Lengths, gross tons	15 00 to 15 25
Old Iron Axles, gross tons	21 00 to 21 50
Old Iron Car Wheels, gross tons	16 00 to 16 50
Stove Plates, gross tons	9 75 to 10 00
Wrought Turnings, net tons	11 50 to 11 75
Cast Borings, net tons	5 50 to 6 00

PHILADELPHIA.

Feb. 18

Scarcity of material is retarding operations at several points, and how far it may affect general conditions is one of the uncertainties which confront the market. Consumers holding urgent contracts are falling over one another in their efforts to secure what little material it is possible to scare up, and paying prices which ordinarily would lead to a sharp reaction. The transportation interests are not yet in a position to guarantee prompt service and the result is that production is not kept up to the point demanded by consumption. Further attempts have been made to secure relief through importation from abroad, but it is not believed that much can be expected from that source.

Pig Iron.—Prospects of relief are far from encouraging and reports show that stocks are being continually lowered. It seems as if the furnaces are turning out less iron than they calculated on, and on the other hand every indication points to the fact that consumers have under-estimated the volume of their requirements. Practically, there is nothing left unsold for the first half of the year, although it is probable that materially higher prices would bring about the release of a portion of the iron controlled by well supplied concerns. In a general way the trade is opposed to further advances as being injurious to the permanent welfare of business. It is almost impossible to assemble any definite data as to current transactions, but in a general way the following is believed fairly to represent Philadelphia and nearby points: No. 1 X foundry, $18 to $18.50; No. 2 X foundry, $17.50 to $18; No. 2 plain, $16.50 to $17; standard gray forge, $17 to $18; ordinary gray forge, $16 to $16.75; basic (chilled), $17 to $18; Bessemer, $20 to $20.50.

Finished Material.—The consumption of plates is, to some extent, retarded through the scarcity of structural material, though manufacturers appear to have all the business they can handle comfortably. In the bar trade heavy orders were placed before the recent advance and new business is not as brisk, although the mills have orders enough to keep them going for some time to come. Requisitions for sheets are being placed with greater freedom. The market appears a little irregular in spots, but in a general way prospects are satisfactory and a large business seems assured for many months to come. Prices are about as follows for city and seaboard deliveries: Plates, ¼-inch and thicker, 1.75c to 1.80c; bars, iron or steel, 1.62½c to 1.70c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

Old Material.—Higher values in other lines have added firmness to the scrap market and prices, as a rule, show advances. Bids and offers are about as follows for deliveries in buyers' yards: Choice railroad scrap $21 to $21.50, ordinary light scrap $13 to $13.25, machinery cast $14.75 to $15.25, heavy steel scrap $19.25 to $19.50, old iron rails $21.50 to $22.50, wrought turnings $13.50 to $14.25, cast borings $8 to $8.50, old iron axles $25 to $26, old steel axles $22.50 to $23, old car wheels $17 to $17.50.

LAKE SUPERIOR IRON MINES.

One of the most important iron mining deals of recent months, and one especially significant as indicating the policy of the United States Steel Corporation to get possession of available properties for the more remote future, was put through last week. H. O. Young, of Ishpeming, Mich., representing the steel corporation mining company, purchased 640 acres, or one-fourth each of sections 28, 29, 32 and 33 on the Cascade range. The lands are known as the Wick property and contain the Richmond, Starwest and Platt mines. The ores are silicious, yielding about 40 per cent iron and .030 to .040 phosphorus. There is a lease of the Richmond to Alex Maitland and others and it has fifteen years to run. The Platt is being unwatered by the Donora Mining Co., a connection of the Union Steel Co., of Pittsburg. The Starwest, known also as the Prout or Wheat, has not been active for months. The silicious ores from these mines are used in mixture with the low silica ores of the Mesabi range. The supply on the lands which have been acquired in fee simple is well-nigh limitless. The action of the steel corporation in buying these lands is commented on, as it will be years before it can take ore from two of them, and meantime the leaseholders may make large inroads on the supply.

The Breitung Iron Co. held its annual meeting at Marquette, Mich., last week, electing George Wagner, president; John F. Carey, vice-president; E. N. Breitung, secretary and treasurer. The company's property is 25 miles northeast of the Canadian Soo in territory reached by the Algoma Central. Only one-half mile of track is yet to be laid to connect the mine with this line. The ore was found outcropping on a side hill, and a tunnel from the base has been driven 167 feet, the ore being a short distance further. Thus far Bessemer ore similar to that of the Ishpeming district has been found. All the Bessemer ore that can be produced will probably be taken for the Clergue blast furnaces at Sault Ste. Marie, Ont.

The Kloman mine, at Republic, Mich., which adjoins the Republic mine, is now the subject of negotiations. Because of complications over the title the mine has been idle since 1881, but the title has recently been cleared. The mine is believed to have a continuation of the Republic ore body. Of 20,000 shares of the mining company, Iron Mountain, Mich., parties own 14,000. Of the remaining 6,000 Andrew Carnegie is said to have 2,800, Henry Phipps 1,600 and Mr. Miller, of Pittsburg, 1,600. An offer of $175,000 is reported to have been made for the mine; the owners ask $200,000.

Iron Ore, of Ishpeming, Mich., notes that at the Hemlock mine, Amasa, Mich., greenstone has been encountered in the 7th level, and there is some fear that the bottom of the mine may have been reached, greenstone being the formation in which the ore is enclosed. However this cannot be known for months and meantime a turn in the formation is hoped for.

The Eastern Minnesota Railroad has acquired leases of two properties in sections 12, 57, 21, on the Mesabi range—one a forty and the other two forties. The bonus in the two leases was $225,000.

American Steel Inspectors Going to Europe.

Messrs. Robert W. Hunt & Co. have been given the inspection of the rails, splice-bars, bolts, nuts and spikes, which the Mexican National Railway Co. have purchased in England and Belgium. They have also been given the inspection of rails which the Louisville & Nashville Railroad Co. has purchased in Germany. John J. Cone, of the firm, will have immediate personal charge of the inspection of this material and will take with him to Europe a detail of men selected from his firm's American corps of inspectors.

THE SCHELLENBACH VARIABLE FEED AND SCREW-CUTTING ATTACHMENT.

This system of gearing has been introduced as a substitute for independent change gears and feed cones and is sold in the form of an attachment applicable to any lathe in use, and as a general thing all that is necessary to apply this device is a pair of stout bolts in the regular quadrant.

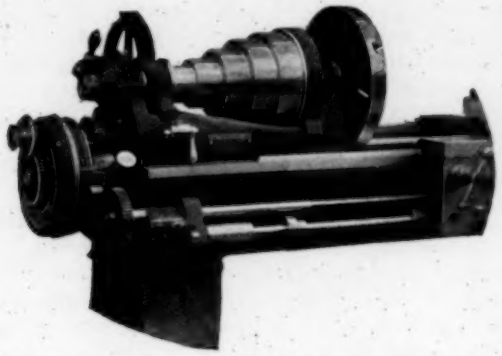


FIG. 1.—THE SCHELLENBACH VARIABLE FEED APPLIED TO LATHE.

The device is illustrated in Fig. 1, in position on the lathe, and Fig. 2 shows a view of the details of the system. The parts are assembled in the front view illustrated in Fig. 3 and the back of the scheme is seen in Fig. 4. On reference

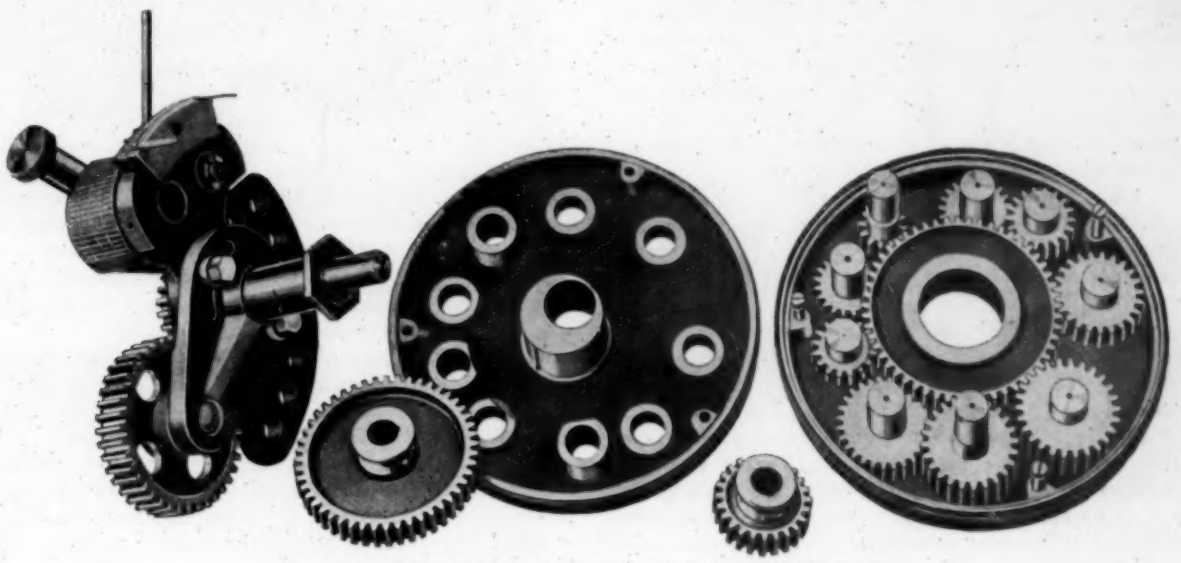


FIG. 2.—DETAILS OF THE SCHELLENBACH SYSTEM OF GEARING.

to Fig. 2 it will be seen that the system of gearing consists of a circular arrangement of nine gears, having varying diameters and numbers of teeth, clustered about and engaging with a central intermediate gear. The main shaft projects through the center of a sleeve, the outside of which forms a bearing for the circular gear casing. The gear on the forward end of this shaft is interchangeable with the one shown on the rim of the gear casing, an exchange being made by simply pulling these gears from their stems and replacing them in the desired positions. This transposition is but once necessary in the entire series of changes as all others are made by rotating the casing and operating the clutch for either right or left-hand movement of the carriage. The engagement of the right and left-hand clutches should be made while the lathe is in motion. These clutches are thoroughly hardened and are intended to be used in this manner.

The drive is only through two gears in the casing, and the common intermediate which takes its bearing on a long hub cast within the bearing. For general purposes the 30 regular changes are sufficient and on the No. 4 attachment these cover the following threads per inch: 4, 5, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 36, 40, 42, 44, 46, 48, 52, and 56. The table of feeds is, of course, in the same proportion. This range is attained on the No. 4 attachment by driving, if the lathe has 4 threads per inch on the lead screw, from a 36-tooth gear on the spindle or stud to a 48-tooth gear on the lead screw. If the 24-tooth gear is substituted on the screw then one-half the index, or from 2 to 28 threads per inch, can be cut and coarser feeds obtained. The contrary is also true and by making the reduction in the size of the driving gear the series will comprise a range of finer threads and feeds. This procedure may be carried out indefinitely. Gears of other proportions are used accordingly as the number of threads per inch on the lead screw may vary.

The elevation in Fig. 4 shows the locking lever which re-

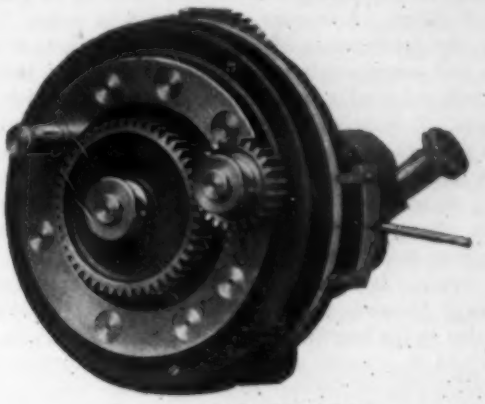


FIG. 3.—FRONT ELEVATION.

tains the casing in position after turning to the desired gear. The numerous holes are drilled in the plate for ready attachment to the different makes of lathes and there is a possibility that even the present supply may not be sufficient

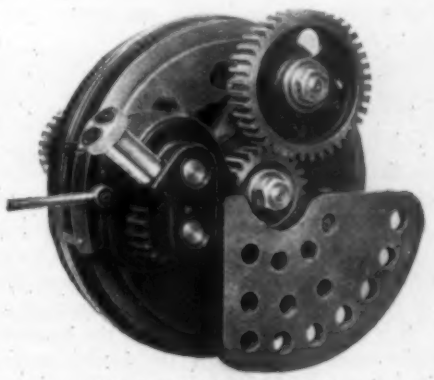


FIG. 4.—REAR ELEVATION.

for every case and another hole may be drilled if there should be need of it.

This attachment is manufactured by the National Machine Tool Co. of Cincinnati, O.

Reaves & Co., of Columbus, Ind., manufacturers of engines and separators, have opened a branch office in Oklahoma City, Oklahoma, with J. A. Tobin as manager.

A GROWING SUPPLY OF MANGANESE.

The production of manganese throughout the world is increasing at a rate at least commensurate with the growth of the demand for it. Its use has expanded very materially in recent years, in connection with the manufacture of Bessemer and open-hearth steel, but the element is of tolerably wide distribution in localities where it is capable of easy working, in relation to the consuming centers, and there is no reason to fear for a failure of supplies in the years to come. On the contrary, the development of new mines promises to lead to a plethora, and consequently to a serious fall in prices, unless the manufacture of steel grows *pari passu* with it, which seems improbable. It is estimated that the world's production during the past year was close upon 900,000 tons, of which over 430,000 tons were supplied by Russia, 120,000 tons by Spain and Portugal, 83,000 tons by India, and the remainder by other countries, among which Brazil leads with a round 70,000 tons. The Russian contribution forms the backbone of the whole annual supply. It comes mainly from the Trans-Caucasus, and Consul Stevens, at Batum, the great port of shipment, tells us that in the last fifteen years the exports have increased over tenfold in volume, and that, with the reduction at the beginning of 1899 of the rate of transport by rail from Tehiature to the trunk line at Sharopan, the trade has been further stimulated. The mines are located in several villages on the right bank of the River Kvirilli, and in three more on the left bank on the same stream. There are something like 300 producers, so that the individual average is small—it has been described as a cottage industry rather than a large mining enterprise based on sound principles. But it is allowed that the average production per mine is growing; today it is about 1,300 tons, whereas in 1895 it was no more than 545 tons. And production has been economized, for now the average for each man is 170 tons of ore, as compared with 43 tons six years ago.

There is, apparently, plenty of room still for an improvement in methods, for we are told that "it is not the introduction of machinery, or any other improved or more modern methods of mining that have brought about the increase in production referred to above, but simply the fact that at present less attention is paid to the sorting of manganese, and to separating the good from the bad ore. In some instances, producers go so far that they do not clean the ore at all, but have it transported to the railway platforms in the condition in which it is produced at the mines; others, again, increase their production by the simple means of admixing the waste of previous years to their freshly-mined ore." In other words, there is such an abundance of easily-won material that there is no endeavor to produce economically, or to conserve the resources of the district. The United Kingdom has taken close upon 40 per cent of the total exports from Batum and Poti in recent years, Germany coming second with 18 per cent, imported mostly by way of Holland; and it is noticeable that its proportion of the whole (though still small) has increased steadily year by year, while the English demand has fluctuated in a very erratic manner.

Very striking progress has been made in the last five years in the mining of manganese in Huelva, which accounts for virtually the whole of Spain's contribution. In 1895 only 33,353 tons were sent abroad. In the following year the total increased to 90,821 tons, and in 1899 to 138,419 tons, this representing high-water mark. The diminished quantity for the past year is referable to the slackening of activity in the steel trade. Spain will be very pleased to increase its export if called upon, for though the lodes are superficial and patchy, and not too rich in mineral, there are plenty of them still unworked. It is an interesting feature of the Spanish deposits that they never reach great depths, the deepest property being the Santa Catalina, which is about a hundred meters. Mr. Carl Doetsch, a member of the leading shipping firm at Huelva, says the ore consists, as a rule, of a mixture of manganese silicate in varying proportions, and appears in many different forms, frequently suggestive of jasper. The outcrop (often jasper), and the upper portions of the deposits, in so far as they consist of ore, are always converted into compact brownstone, known locally as "peroxide." The number of separate lenticular beds, and masses, is considerable. Indeed, mining operations have shown with certainty the existence of some 100 deposits, and this total may be added to by future discoveries. As a rule, the ore averages 31 per cent to 32 per cent manganese metal, and 28 per cent to 30 per cent silica; the high contents of silica render these ores unfit for treatment of ferro-manganese and for fair-class iron ore, while they are found suitable for the "Minette" ores of Luxembourg, which require silica. This circumstance accounts for the large export to Belgium.

It is a misfortune for India that it is situated so far away from the countries which consume manganese. Were it otherwise, it might make a close fight with Russia for first place, for its deposits are among the most extensive and rich in the world. Brazil is much more favorably located, and as a consequence it is making greater strides. The trade dates virtually from 1894, when operations commenced on the now well-known mines of Miguel Burnier, about 300 miles from Rio de Janeiro. Mr. H. K. Scott has given full information regard ing this manganiferous district in a paper read before the Iron and Steel Institute. The ore is comparatively rich—a very pure black oxide, containing from 50 to 55 per cent of metallic manganese, and only traces of phosphorus. The best varieties exist between layers of impure earthy ores of iron and manganese, which lie between beds of limestone, which, in turn, are enclosed between beds of mica-schist. The impure and mixed earthy ore beds, which sandwich the manganese ore, are locally know as "Jacutinga," and it is the association with these beds that generally indicates purity in the manganese ore. The latter outcrops near the summit of the hills, and varies very much in thickness. It has been worked to over 120 yards from the surface, and shows no material change in character. The ore, says Mr. Scott, is first excavated by opencast workings, which, when no longer practicable, are superseded by levels in the hillside, small levels being first driven to locate the direction of the curving and erratic bed of ore. All the levels and workings are dry, owing to their altitude, and the ore is simply thrown into the shoots, without the necessity for picking, the cargoes showing a general uniformity in their analysis. The amount of ore in sight, and of easy extraction without motive-power, is estimated at 2,000,000 tons on the present Usina Wigg properties. The best customer for Brazilian manganese is the Carnegie branch of the United States Steel Corporation.

On the Continent some valuable discoveries have been made. In South Hungary, deposits have recently been found at Pojen, in the Krasso Szareny county. In Italy, near Genoa, are other valuable beds. At Monte Porcille are three beds, estimated to contain an aggregate of 1,308,000 tons of ore. At Monte Zenone the ore contains on an average 42.52 per cent of manganese, and 19.89 per cent of silica. It is estimated that 2,800,000 tons are available.—[Engineering.

The Van Zandt-Claypool Machine Co., of Fort Worth, Tex., has purchased the Fort Worth Iron Works plant of the same place for a consideration of $15,000.

The shut-down of the Buffalo Steel Co.'s plant at Tonawanda, N. Y., of which mention was made recently, was of but three days' duration and was due to inability to get coal and coke. The plant is now running full and expects to continue without interruption. The products are bars, angles, channels and tees, especially for agricultural implements.

The Locke Machine Works, Bradford, Pa., which were entirely consumed by fire on June 29, have been rebuilt, the new building being a considerable improvement on the old. The works were started running December 1, and have been fully employed since then.

The recently organized Keystone Stove Foundry, Spring City, Pa. (capital stock, $60,000), has obtained the plant formerly operated by the Schuylkill Valley Stove Co. and is now ready to handle repairs and stoves of the latter company's patterns.

The Bass Foundry & Machine Co., Fort Wayne, Ind., has been awarded the contract for the erection of an engine for the plant of the American Tin Plate Co. at Martin's Ferry, Ohio. It will have a capacity of 2,000 H. P.

A PORTABLE PNEUMATIC RIVETING MACHINE.

The riveting machine illustrated in the accompanying halftones is designed for work on beams and girders in bridge

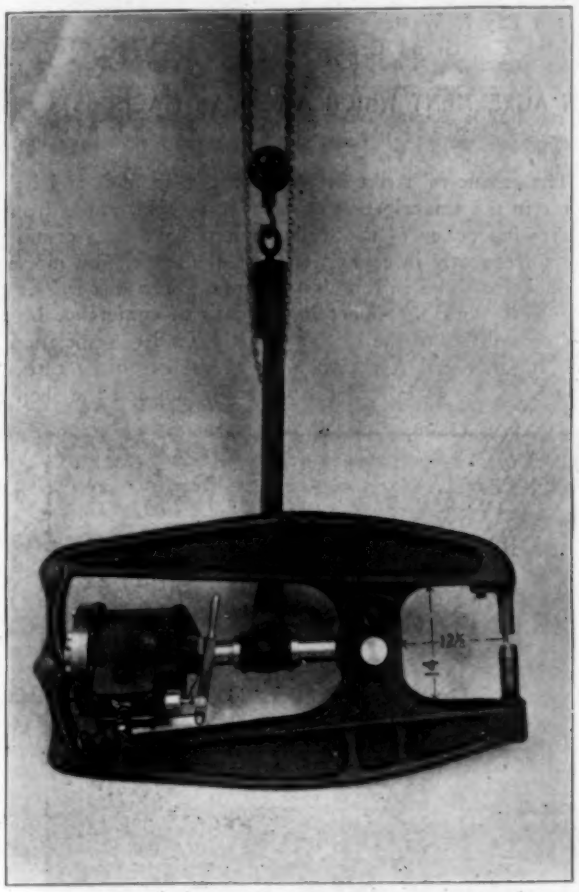


FIG. 1.—ALLEN PORTABLE PNEUMATIC RIVETER.

building. The levers, turning on a fulcrum, contain at one end the dies for forming the head of the rivet and at the

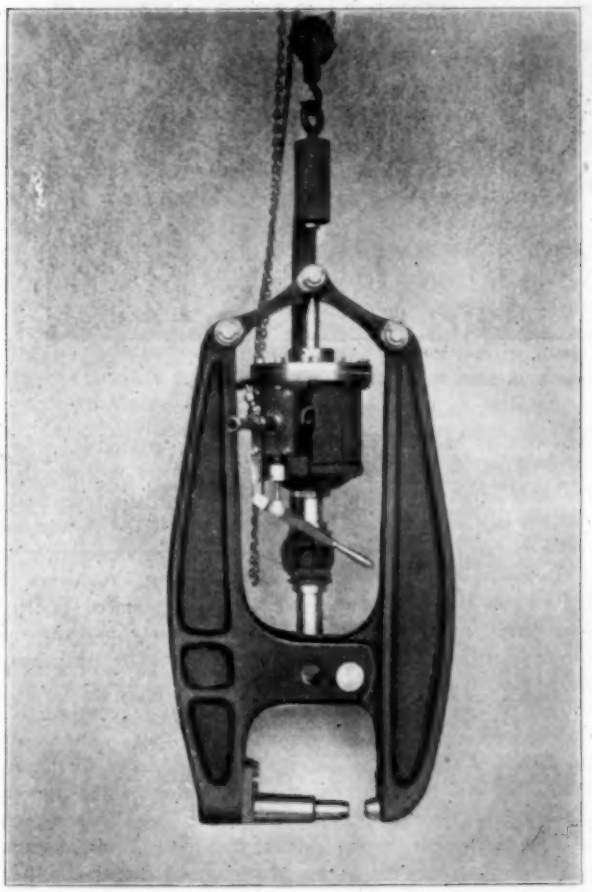


FIG. 2.—ALLEN RIVETER ARRANGED FOR VERTICAL WORK.

other end are connected to a toggle joint; the center of the linkage being attached to the piston rod of a pressure cylinder. The arms are interchangeable, so that one set will straddle the edge of girders, while the other will serve to drive rivets in plates where several rows of rivets have to be driven and a protruding nose is required to reach them—a condition existing in the rivet work on some car trucks for which the present design has been found well adapted. Three machines have been built for the Sterlingworth Railway Supply Co., to be used in close work on plates in their cars.

The pressure used on the machine is from 60 to 75 pounds to the square inch and the arms are of sufficient strength to drive one-inch rivets. In consequence of the peculiar construction of the toggle joint, a small ten-inch cylinder will produce at the end of the stroke, or when the dies are nearly closed, a pressure upon the rivets of about fifty tons. The means employed for the suspension of the machine are conveniently arranged. The tool is attached to a suspension arm by a knuckle joint at the center of gravity and the whole apparatus may be turned to any desired position with great freedom. The advantage of this construction can be seen in the ready application of the tool to almost any position in which a rivet may be placed provided the gap of the machine will allow the dies to reach the ends of the rivet. The general

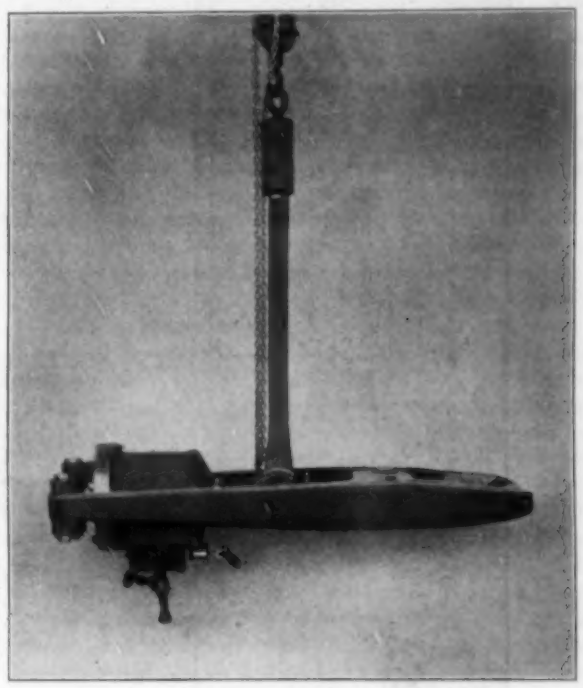


FIG. 3.—ANOTHER ARRANGEMENT OF THE ALLEN RIVETER.

adaptability of the device is thoroughly shown in the engravings where the one machine may be seen in various positions.

The weight of the tool under consideration is 1,250 pounds and it is manufactured by John F. Allen, 370-375 Gerard Ave., New York.

The wire and wire nail plant of the Hartman Manufacturing Co., at New Castle, Pa., which recently went into the hands of a receiver has been placed in operation. The plant is to be operated by E. A. Henry, of the Cuyahoga Steel & Wire Co., of Cuyahoga Falls, O.

The new plant of the Knoxville Wheel & Foundry Co., Knoxville, Tenn., will be placed in operation within the next three or four weeks. Mine car wheels and castings for the saw mill trade will take the major portion of the output of the plant.

The recent purchasers of the Durham furnace of Doylestown, Pa., have organized The Durham Iron Co. to operate the furnace. Already operations are being carried on looking towards the enlargement of the furnace and when these are completed the furnace will be blown in. Jerome Keeley, of Jerome Keeley & Co., Philadelphia, Pa., is the president of the new company. Mr. Keeley's son is the superintendent of the furnace. The capitalization is $100,000, fully paid up, and bonds amounting to $150,000 have been issued.

BOILER WORKS COMPRESSOR PLANT.

We give an illustration below of a compressor plant installed at the boiler works of S. Freeman & Sons, Racine, Wis., by A. J. Fisher, of 50 South Clinton street, Chicago. It has a capacity of 300 cubic feet of free air per minute and is of 10-inch bore and 42-inch stroke. The compressor is attached to an E. P. Allis Corliss engine 26x42 inches and operates tandem fashion, furnishing air for operating pneumatic tools and a three-ton pneumatic elevator. No changes were made on the engine except the reconstruction of a new back cylinder head suitable to receive the compressor. The back cylinder head was fitted with a stuffing box to receive the piston rod of the compressor and the head was drilled and tapped to attach the two tie rods which hold it firmly in position. No foundation was necessary except enough to carry the weight of the compressor.

The piston rod of the compressor is screwed into the piston of the engine operating in unison and in a direct line. The compressor is supplied with an automatic unloading and regulating device that regulates the air compression accordingly as the air is consumed. This feature makes it a very economical and effective machine, as no air is compressed unless the receiver pressure falls below the point set on the regulator, the result being a saving of fuel. The air cylinder is thoroughly cooled by a water jacket and the compressor is so arranged that a free air supply can be piped from the outside of the engine room.

The capacity of the compressor can be increased or decreased by a simple change in the diameter of the inner cylinder and piston. For instance, if the bore is five inches in diameter and the stroke 18 inches, the capacity may be increased by removing the five-inch cylinder and substituting one that is 10 inches. No change is required in either of the valves, cylinder heads or water jacket. This change can be quickly made and at a nominal cost. The valves are of tool ones at any time. Their construction will be understood from the section elevation, Fig. 2.

Fisher compressor plants have been installed in the plants of the following concerns: Featherstone Foundry & Machine Co., Winslow Bros., S. Wilks Mfg. Co., South Halstead Sheet Iron Works, Brown Bros. Foundry, E. A. Schreiber, and Chicago Crushed Stone Co., all of Chicago; Maryland Car Wheel Works, Baltimore; C. B. & Q. Railway (2) Aurora, Ill.; Green Bay & Western Railway, Green Bay, Wis.; Kenwood Bridge Co., Grand Crossing, Ill.

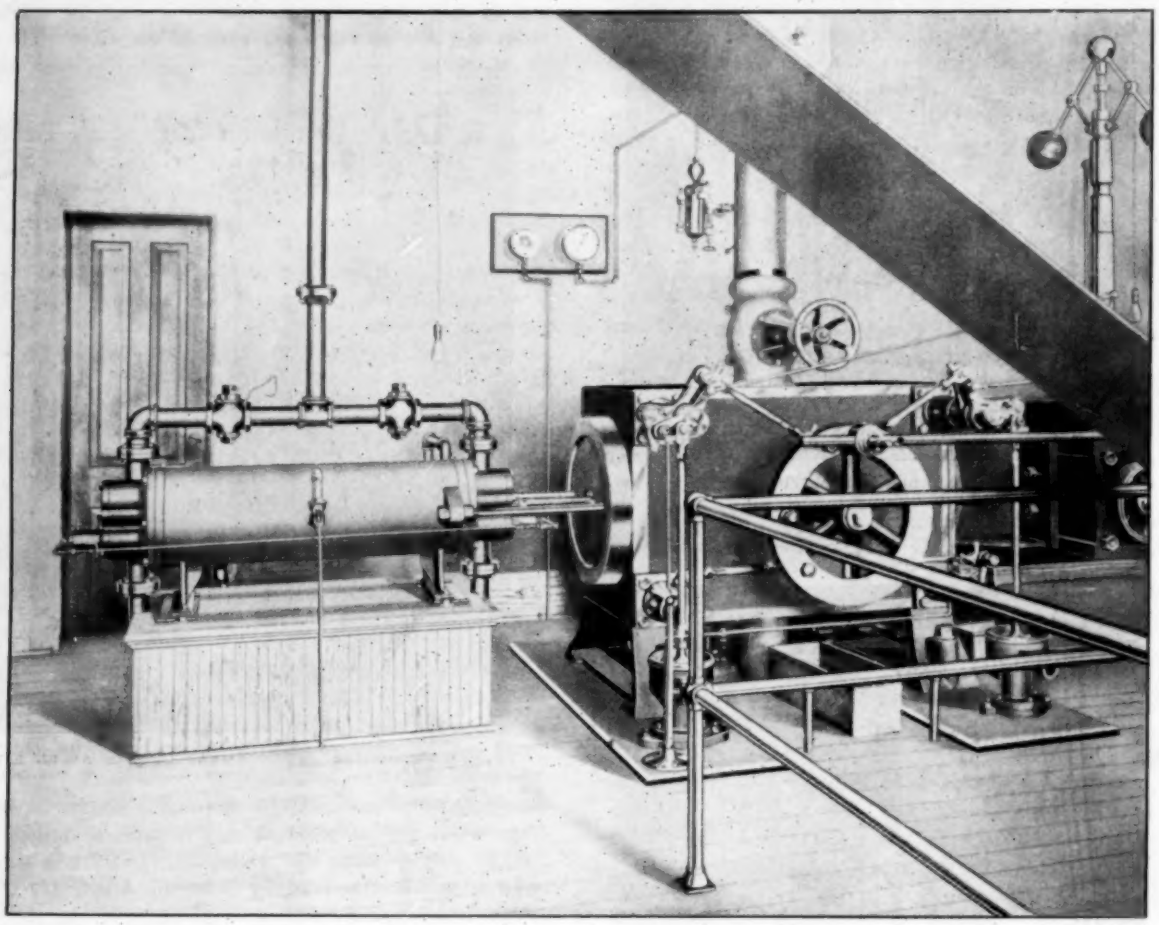


FIG. 1.—FISHER COMPRESSOR IN A BOILER WORKS.

AN AGREEMENT WHICH AMERICAN MACHINISTS MIGHT STUDY.

The engineers' strike in Great Britain in 1898, and its outcome in the emancipation of English machine shops from the narrowing policy of the trades unions have been commented upon frequently in connection with the association movement in machine shops in the United States. The discussions over the New York agreement in the days of conference between the committees of the National Metal Trades Association and the International Association of Machinists often turned on phases of the great strike in Great Britain and the shop conditions that had been established by its settlement. Particularly timely on this account is the agreement recently drafted for ratification by the union machinists and the federated employers in Great Britain, and we reprint it for the benefit of those of our readers who have had a part in association work. The agreement is between the Engineering Employers' Federation on the one hand, and the Amalgamated Society of Engineers, the Steam Engine Makers' Society, and the United Machine Workers' Association, and is at present awaiting ratification by the votes of the men. The new agreement was sought by the three unions named, and is in continuation of the agreement which was drawn up in 1898. The result of the ballot of the men is expected to be in favor of the agreement. It will be seen that the provisions of the agreement make much greater concessions than the New York agreement of the machinists' union, which the latter broke because it gave the management of his business too largely to the employer:

General Principle of Freedom of Management.—The employers shall not interfere with the proper functions of the trade unions, and the trade unions shall not interfere with

the employers in the management of their business. Employers shall have the right to introduce into any federated workshop, at the option of the employer concerned, any condition of labor under which members of the trade union were working prior to the date of this agreement in any of the workshops of the federated employers, and the trade unions shall have the right to bring forward for discussion any question arising therefrom, as hereinafter provided for. Nothing in the foregoing shall be construed as applying to the normal hours of work, or to general rises and falls of wages, or to rates of remuneration.

Freedom of Employment.—Every workman may belong to a trade union or not, as he may think fit. Every employer may employ any man, whether he belongs or not to a trade union. With the desire to secure peaceable and harmonious working in federated workshops, the trade unions will not permit on the part of their members any interference with non-union workmen, nor countenance any objection to working with them. The Federation will not permit of difference of treatment between union and non-union workmen in the course of their work, and will not countenance their members objecting to employ union workmen.

Piece-Work.—Employers and their workmen have the right to work piece-work. The prices to be paid for piece-work

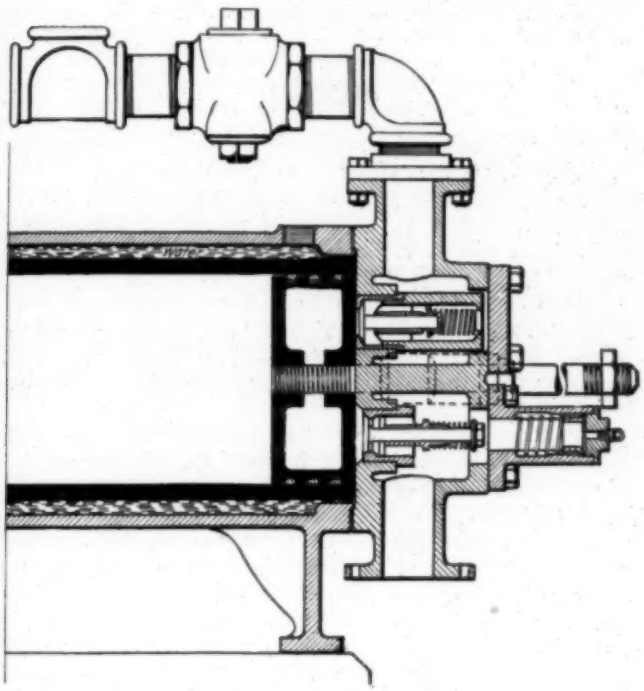


FIG. 2.—SECTIONAL ELEVATION.

shall be fixed by mutual arrangement between the employer and the workman or workmen who perform the work, and the employers guarantee that they shall be such as will allow a workman of average efficiency to earn at least his time rate of wages, with increased earnings for increased production due to additional exertion on his part. The Federation will discountenance any arrangement or rearrangement of prices which will not allow a workman to obtain increased earnings in respect of increased production due to such additional exertion, and the trade unions will discountenance any restriction of output. The Federation agree to recommend that all wages and balances should be paid through the office. A mutual arrangement as to piece-work rates between employer and workman in no way interferes with the trade unions arranging with their own members the rates and conditions under which they shall work.

Overtime.—The Federation agree to recommend that, when overtime is necessary, no union workman should be called upon to work more than 40 hours' overtime in any four weeks after full shop hours have been worked, allowance being made for time lost through sickness or absence with leave. In the following cases overtime is not to be restricted, viz.: (1) breakdowns in plant; (2) general repairs, including ships; (3) repairs or replace work, whether for the employer or his customers; (4) trial trips. In cases of urgency and emergency restrictions shall not apply, but the Federation will recommend its members to avoid excessive overtime.

Rating of Workmen.—Employers shall have the right to employ workmen at rates of wages mutually satisfactory to the employer and the workman or workmen concerned. The trade union shall have the right to arrange with their members the rates at which they will accept work, but shall not interfere with the wages of other workmen. General alterations in the rates of wages shall be negotiated between the respective employers' associations and the local representatives of the trade unions.

Apprentices.—There shall be no limitation of the number of apprentices.

Manning of Machine Tools.—Employers shall have full discretion to appoint the men they consider suitable to work all their machine tools, and determine the conditions under which they shall be worked.

Selection, Training, and Employment of Operatives.—Employers shall have the right to select, train, and employ those whom they consider best adapted to the various operations carried on in their workshops, and will pay them according to their ability as workmen.

Displacement of Labor.—The Federation recommend their members that when they are carrying out changes in their workshops which will result in a displacement of labor, consideration should be given to the case of the workmen who may be displaced, with a view if possible of retaining their services on the work affected or finding other employment for them.

Provisions for Avoiding Disputes.—With a view to avoid disputes, deputations of workmen shall be received by their employers, by appointment, for mutual discussion of questions in the settlement of which both parties are directly concerned. In case of disagreement, it shall be competent for either party to refer the question to a conference to be held between the local association of employers and the local representatives of the trade unions. In the event of either party desiring to raise any question, a local conference for this purpose may be arranged by application to the secretary of the employers' association or of the trade union concerned, as the case may be. Local conferences shall be held within 12 working days from the receipt of the application by the secretary of the employers' association or of the trade union or trade unions concerned. At local conferences members of the executive board of the Federation and members of the central authority of the trade union or trade unions may be present, in addition to the local representatives. Failing settlement at a local conference of any question brought before it, it shall be competent for either party to refer the matter to the executive board of the Federation and the central authority of the trade union or trade unions concerned. Central conferences, which shall be composed of members of the executive board and members of the central authority of the trade union or trade unions concerned, shall be held within 12 working days from the receipt of the application by the secretary of the employers' association or of the trade union or trade unions concerned. Until the question has been discussed in local and central conference there shall be no stoppage of work either of a partial or of a general character, but work shall proceed under the current conditions.

American Foundrymen's Association to Meet in Boston.

Dr. Richard Moldenke, secretary, Box 432, New York, announces in a circular to the members of the American Foundrymen's Association that the convention for 1902, on invitation of the foundrymen of New England, will be held in Boston, Tuesday, Wednesday and Thursday, June 17, 18 and 19. Details concerning reduced rates, hotel accommodations and the convention program will be announced later.

The Hecla Charcoal Iron Co., of Ironton, O., recently incorporated at Columbus, O., has leased the Hecla furnace at that place and will make cold blast charcoal iron exclusively. The furnace will be remodeled and will be ready for operation about June 1. E. J. Bird, Jr., is president of the company; Geo. W. Keye, vice-president, and F. J. Horschel, secretary and treasurer.

THE LACKAWANNA STEEL CO.

The Lackawanna Iron & Steel Co., with its Pennsylvania charter, goes out of existence to make way for the new Lackawanna Steel Co., with a capital stock of $40,000,000, which was incorporated at Albany, N. Y., Feb. 14. The charter permits it to manufacture iron, steel and other metals, operate mines, lumber lands, furnaces, mills, elevators, water works, viaducts, aqueducts, canals, etc. The directors named in the papers of incorporation are H. McK. Twombly and D. O. Mills, of New York; Henry A. C. Taylor, of Newport; J. G. McCullough, of North Bennington; H. Walters, of Baltimore, and Samuel Mather, of Cleveland. The headquarters of the company is given as West Seneca, Erie county, N. Y. The old company's capital stock was $25,000,000. The work of financing the new company is in the hands of the Farmers' Loan & Trust Co., of New York.

The new incorporation comes on the heels of a number of important moves by the company, one of which is its preparation to enter upon the manufacture of structural steel. Others are the acquisition of ore properties on the Mesabi range, the firm of Pickands, Mather & Co., of Cleveland, being interested jointly in some of these. It is known also that the Lackawanna company has long-time contracts for ore from old-range as well as Mesabi mines. Its requirements in ore are expected to be in the neighborhood of 2,000,000 tons a year.

The capital stock of the new company is to be divided into 400,000 shares of the par value of $100 a share, and $20,000,000 of this stock is to be exchanged for an equal amount of stock in the old company now held by the stockholders of the Lackawanna Iron & Steel Co. There is to be held in the treasury of the new company, subject to future disposition by the board of directors, $5,000,000 of stock. The remaining $15,000,000 of capital stock of the new company is offered to holders of the $20,000,000 of stock in the old company, in amounts proportionate to their holdings in the old company and which they have exchanged for stock in the new company. It is provided in the agreement that 20 per cent of the par value of the new stock thus issued shall be deposited with the trust company at the time the application for new stock is made. It is further provided that the remaining 80 per cent of the par value shall be paid to the trust company in installments of 20 per cent each, the first installment to fall due within sixty days after the agreement is accepted, the remaining three installments to be paid at regular intervals to be determined by the trust company. The old company's stock must be turned over to the trust company by March 1.

In the agreement received by stockholders it is stated that it has been "considered necessary to make provision for the construction of a much larger plant near Buffalo than was originally planned, so as to provide for the manufacture of plate and all classes of structural steel and other materials, in addition to steel rails and billets, and with a total capacity for the production of about 1,250,000 tons, or upward of finished product per annum, and also to acquire control of additional ore and coal properties to meet the needs of such enlarged manufacturing capacity."

John J. Albright, of Buffalo, who bought more than $1,000,000 worth of land for the steel company at West Seneca, and who has had charge of the Buffalo interests of the company in advance of the removal of headquarters to that city, is quoted as follows:

"The Lackawanna Steel Co. is a new corporation and not the reorganization of an old company. We were hampered under the old charter, one disadvantage being that the Pennsylvania law, under which it was granted, required some of the directors to live in that state. Now, the old stock is sold to the new company and stock in the Lackawanna organization is issued for the old, share for share, to the extent of $20,000,000, and the rest of the stock in the new corporation, raising the total of the capital stock to $40,000,000, goes to those who subscribe for it. We preferred a New York charter to the old one and have obtained it in the regular way.

"The directors of the new corporation, as specified in the articles filed at Albany, will organize soon by the election of officers and they have power to increase the number of directors to 21. Soon after they are organized they will make such increase in due form and then some of the directors of the old company will enter the board of the new corporation. It was deemed best, in making the change from one company to the other and in organizing in this state not to have any of the old directors made directors in the new organization in the articles by which it was created.

"I am glad to say that the increase in capital stock means a great enlargement of the plant of the company and the firm establishment of a vast industry at this point. The statement of a New York paper, repeated in this city, that our company gets ahead of the United States Steel Corporation in making structural steel is a mistake. Structural steel was made in this country long before even the United States Company was organized. We are not getting ahead of anybody, nor behind anybody. We simply think there is money in making that kind of steel and shall equip our plant to make it. Other companies are engaged in the same business and presumably at a profit and we shall try to do business on a profitable basis. That does not depend on our getting ahead of any rival in making anything. Time is not of the first consequence in our work. To be ahead or behind in the beginning of a new form of industry is not so important as to have a first-class plant. There is room for us and for all our competitors in this business and there will be nothing but friendly relations amongst us. Other concerns go right ahead and do business and we shall do the same when we start up in earnest."

PERSONAL.

John McInnes, formerly superintendent of the shipyards at Bath, Me., has been appointed superintendent of the Hampton Roads Shipyard & Drydock Co., of Norfolk, Va.

President Charles M. Schwab, of the United States Steel Corporation, and C. T. Schoen returned to New York from Europe on the St. Paul, Feb. 16.

Superintendent M. McDonough, of the Dennison plant of the American Sheet Steel Co., has been transferred to the Muncie, Ind., works of the company. J. V. Jenkins, of Canal Dover, O., has succeeded him as superintendent of the Dennison plant.

J. V. Bacon, who has been superintendent of all the Illinois plants of the American Steel & Wire Co., has been transferred to Rockdale. T. J. Lutz has been appointed superintendent of the Scott Street plant of the company at Joliet, Ill.

George F. Baer has retired from the presidency of the Reading Iron Co. and has been succeeded by F. C. Smink, who was vice-president. The changes occurred at a meeting of the board of directors, at Philadelphia, last week.

Arthur B. Clarke has resigned as secretary and treasurer of the Old Dominion Iron & Nail Works Co. of Richmond, Va. He has been succeeded as treasurer by J. B. Carter, and as secretary by H. R. Wayt.

L. Weiller, French Minister of Foreign Commerce; Baron M. de Lagotellene, director of the French Submarine Cable Co., accompanied by Lieut. Vicompte G. de Faramond, naval attache of the French embassy in Washington, spent several days in Pittsburg last week inspecting the industrial plants in the district.

J. C. Barrett, blast furnace superintendent at the Ohio plant of the National Steel Co., Youngstown, O., gave a banquet to the clerical force and foremen in his employ last week in honor of the new blast furnace record established for furnace No. 2 during the month of January.

Andrew Carnegie donated $50,000 last week for the erection of a workingmen's hospital in the city of Pittsburg.

George M. Sargent, of the Sargent Co., Chicago, accompanied by his wife, sailed last week for a tour to Egypt and the Holy Land. They will be absent several months.

E. E. Buchanan, manager of the Elmira plants of the Empire Bridge Co., has resigned.

President O. P. Letchworth, of the Pratt & Letchworth Co., Buffalo, sails for Europe Saturday on the Kaiserin Maria Theresa.

H. E. Greenwood, manager of the Newark, N. J., works of the Westinghouse Electric & Mfg. Co., resigned on Feb. 1.

John W. Gates, John Lambert, I. L. Ellwood and John Dupee will enter the Chicago stock and grain firm of Harris, Gates & Co. as special partners on March 1.

The Height of Blast Furnaces.

BY F. L. GRAMMER.

Before discussing this subject it should be said that the usual habit of speaking of the height as being the distance between the crucible hearth and top of hopper is for many purposes misleading and inaccurate. The height through which reduction and smelting occurs lies between the tuyere level and stock line. The crucible is chiefly a drip cup where the melted coke ashes, ore gangue and flux separate as slag from the iron as cream does from milk. A 100-ft. furnace thus becomes an 80-ft. furnace, for the tuyeres are frequently 10 feet above the hearth and the stock line 10 feet down from the top. A study of this dimension would teach more than the study of the one generally used. However, in order not to be considered *outre* we will here adhere to the old custom.

Our modern high furnaces probably owe their origin abroad to the marked benefits obtained when furnaces were first raised from 50 to 70 and 75 feet. The fuel economies and the consequent increased product caused many to think there was no limit to decreasing top temperatures, until stone cold. Many also inferred that the output of a furnace was influenced more by its size than any other consideration. The advantages obtained from the first 25 feet above mentioned were so great that the error in reasoning is easily understood. Consequently they built in Europe very high furnaces—as high as some we now have in the United States—which after a time were discarded as a mistake.

One obvious effect (without touching the occult) of raising a furnace 10 or 20 feet, using the same stock, is to increase the pressure of blast; and if the gas issuing from the top of a high furnace is no better as a fuel than that from a low furnace (the idea of building it high was to utilize the gases more and rob the mixture of more CO), we will need boilers, engines and stoves of greater efficiency than with lower furnaces. In addition to these troubles Sir Lowthian Bell showed that a double reaction took place in the top of a furnace, and it was useless to try to decrease top temperatures below a given figure. His proof was complex and profound—almost too much so to be regarded as a proof. In the minds of many in the United States this obstacle and objection remained "not proven."

The satisfactory results obtained in many manufacturing processes by the extensive introduction of labor saving devices and accurate accounting encouraged directors in the opinion that blast furnaces were a good field for such innovations and the poor furnaceman, with his poorly explained phenomena and, I am sorry to add, in some plants absolutely misunderstood reactions, was made "to go way back and sit down."

"We will have water tube boilers, compound condensing engines, with positive inlet and outlet air valves, economical pumps, electric hoists, feed water heaters, automatic fillers, etc.; we will sell the steam left over to the mill:" and the new regime effected pretty nearly all it started out to do. The 100-foot, mechanically equipped, furnace did all these things. The fixed charges went down, labor went down; in short, the cost above materials pronounced it a good thing, as did the increased product. And in many respects it was and is a good thing they were built. Through the accountant the real management passed out of the hands of superintendent into the executive offices and bureaucracy was inaugurated.

Matthew Arnold has said that "strength does not consist in numbers," and Lord Roberts in his recent "Memoirs of India" attributes the Sepoy rebellion getting the headway it did partly to officialism; and he fears the results of their present tendency of centralizing authority in those who are statisticians only. These evils exist in some of our corporations today. In others it is understood and expressed by saying the management is lodged in the hands of those "within the smell of smoke." As an extreme instance of this and also to explain the appropriateness of these remarks, I must refer to that case in which a director of powerful influence was with difficulty dissuaded by his associates from making the new furnace they were building 120 feet instead of 100. He wanted his company to have the "biggest" of all.

Like our British rivals, many of our pioneers in high furnace building thought that time of exposure was a large factor in the reduction of ores; and since all know the product is very nearly proportional to the volume of wind put through the tuyeres, high furnaces with large cubical capacity were deemed necessary to give the requisite time exposure. Some thought the height necessary to give a high pressure for the blast to penetrate a wider hearth.

Now the actual facts as regards large furnaces are, that while some have been run intermittently quite satisfactorily, the majority boast a high fuel consumption; and in many cases the blowing engines have not been able to stand up against the work particularly among those first installed. The high pressures mean numerous leaks around stoves and connections. They have been the scenes of appalling disasters and frequent slips meaning loss of ore and coke. These slips have inspired a certain amount of terror, which with the shortage in available good men, has not been conducive to quick results. Now most of these advantages and none of these disadvantages are to be obtained from Braddock's 90-foot furnaces, one of whose 14-foot hearth stacks made an average of over 630 tons daily in December. No large furnace can surpass that tonnage, and considering the steam economy possible with 90 feet, probably cannot touch her costs.

In the years 1890 and '91 I tried some of Sir Lowthian Bell's experiments on American ores. For our purposes here three things I learned are of interest:

1. As Mr. Laudig also learned, magnetites are not appreciably affected by carbon monoxide at temperatures below 850° fahr.

2. That frequently the platinum boats we had half filled with ore were, when examined, overflowing with carbon deposited during the breaking up of carbon monoxide at certain temperatures.

3. That with lake ores the amount of oxygen removed by the CO (carbon monoxide) was less a function of heat (over 550° Fahr.) and time exposure, than of the quantity and rate of passage of the reducing gas.

Some years ago we were told it took 36 hours to reduce iron ore. So it may with some ores and poor engines. In 1890 it took about 22 hours in a 90-foot furnace, and now I have heard people claim the stock went through in six hours. Eleven is certainly common. I remember in blowing out a furnace, 80 feet high, we stopped filling at 2 p. m. and at 11:30 p. m. taking wind off; nothing but cinder came out the iron notch and no coke was in front of the tuyeres. While this is not entirely a parallel instance it is indicative.

Magnetites requiring 800° Fahr. to be acted upon certainly do not call for furnaces with top temperature below 750°. It would seem with them and refractory ores that a lower furnace would be desired than is required by an ore more readily reduced. Apparently a paradoxical statement; but manganese ores are very successfully reduced in furnaces between 65 and 70 feet in height. Managers treating such refractory ores may do well to hesitate before shouting "Wind," "wind," and, using the lessons before their eyes, say "Heat," "heat."

While we appreciate that there are a number of tricks or steps the superintendent can take which will make a large furnace go and be fairly successful (though never any better than if it were 90 feet), we will only mention one. The stock in the furnace can be kept 10 feet below the regular stock line, requiring, of course, an honest gauger or good automatic gauge. It may also mean a different sized bell and charge, for the stock will then be differently distributed. It will also wear away rapidly the brick work at the top and if iron plates are used, as at some furnaces, there is an increased likelihood of trouble from carbon deposition and finally carrying the stock down means a greater likelihood of explosions. So the remedy is not as simple as it looks.

The high fuel consumption in large furnaces may be due to a poor yield from loss of material spit out by the slips, or from the low burden carried purposely to avoid slips or because the coke is too soft for the greater pressure of high furnaces.

The low bosh construction with regular stock and large volumes of wind, has almost done away with slips near the crucible affecting the grade of metal and chilling the hearth.

The high stock line (high furnace) movement has in-

creased the number of top slips (hardly affecting the quality of metal) and it has introduced some slips of a severity undreamed of before. Mesabis and 100-foot furnaces bowed before the world. Explosion doors save the top from being carried away, but do not save loss of coke and ore. With properly constructed smaller furnaces using large per cents of Mesabi ores they are rare.

The following appear as probable reasons why 100-foot furnaces slip excessively:

1. Most high furnaces have less taper in stack between bosh and stock line than we find in lower furnaces (1 inch in 17 to 1 inch in 15), are good baffle angles. Straighter walls offer a better foothold to the stock and increase the tendency of the stock to arch over.

2. A longer low temperature cylinder offers more opportunities for arching than a shorter cylinder.

3. In large furnaces we have a longer zone of carbon deposition, which occurs below red heat. In our experiments we saw that carbon deposition meant increase in bulk and hence greater likelihood of packing and arching. Unless the ore can be quickly brought down to regions of red heat before too much CO passes over, we are liable to have a slip, and this also offers a possible explanation why a slight sticking is apt to become worse, and very heavy.

4. The fine ore used now is more likely to pack than the lump ore used formerly (think of flour and marbles).

5. With automatic fillers many furnaces can melt no more in an hour than the hoist will put up in ten minutes. There is consequently an increased likelihood of irregular filling (unless proper gauges are used), resulting in longer drops from the bell to top of the stock.

The accountant engineer and bureaucracy are mainly responsible for this false step; for many superintendents courageously opposed it, and the Edgar Thomson and Briar Hill remain before us as monuments that with some, blast furnacing is an exact, relatively, pursuit—and its superintendents by sticking to facts have inspired confidence in their judgment.

There are many things we do not understand in blast furnacing, such as why a piece of metal like steel in a furnace melting no scrap and working badly has several times been found in front of a tuyere—not only Bessemerized, but dephosphorized. The top reactions are not well understood, etc., but because all is not known is no reason why nothing is known.

Multiple tuyeres and high furnaces have been overdone and overestimated. Like fads and fashions, they have had their day, and served their purpose. It is possible many will build large furnaces in the future, but from our present knowledge they seem hardly warranted. The excellent results obtained at several Ohio furnaces can be touched up with a few mechanical devices so as to rival any.

I have heard many men of sound judgment oppose high furnaces; but they put on 10 feet as a "bow in the house of Rimmon."

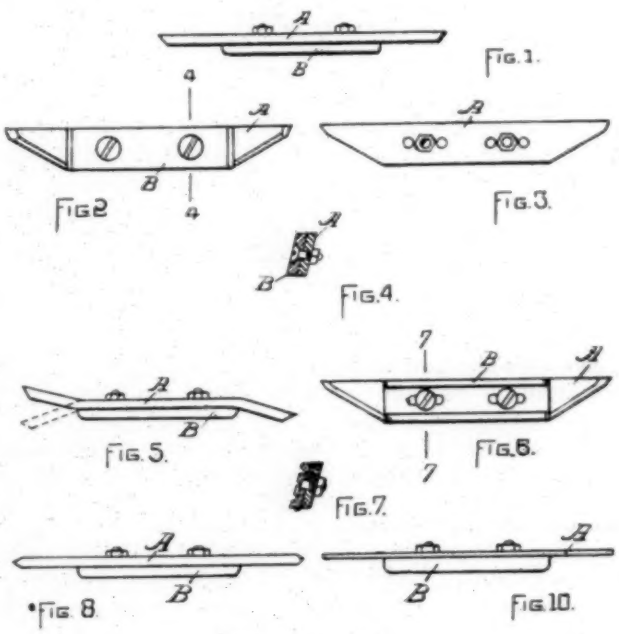
The wholesale slaughter of reputations boasted by high furnaces is a tribute to America's intensity of purpose and conviction. Of 11 new modern plants I can think of but two which did not record a change of superintendents inside of a year, usually in two months. Statistics like these, along with Darwin's theories, clearly show us the "White man's burden," the "strenuous life."

The Grant Tool Co., Franklin, Pa., had its new works in full operation on Oct. 1, since which time it has been kept busy manufacturing machine tools. The company has had a heavy demand for a new lathe for turning car axles, which has several unique features, one being an open side arrangement for inserting the axle, parallel with the bed. The lathe is also specially designed for use of the new Taylor-White process of tool steel. Among orders recently taken are specifications for machinery for the American Car & Foundry Co., the Allis-Chalmers Co., Milwaukee, Wis.; the American Locomotive Works, and the Columbia Engineering Works, Portland, Ore.

H. Wetter Manufacturing Co., Memphis, Tenn., will rebuild its stove foundry, recently burned.

A NEW LATHE TOOL.

A recent invention has been made in that class of lathe tools which are especially adapted for use as side tools, thread-cutting and cutting-off tools, etc. The device may be considered as the combination of one strip of tool steel reinforced by another piece placed alongside the former and secured by screws. In the illustrations 1 to 4, A represents a cutting blade made of a flat strip of tool steel, formed with a beveled upper edge and having the opposite ends forged into the proper shape for use as a side tool, this is provided at the side with tapped holes. The removable reinforcing plate, B, which will usually be made of machinery steel and case-hardened, is drilled to receive the screws by which it is attached to the side of the cutting blade A; the plate being made adjustable toward either end of the cutting blade by moving the screws from one of the tapped holes to another as in Fig 3, or the reinforcing-plate B may be provided with slots for this purpose as shown in Fig. 6. The plate B is beveled at its upper and lower edges, as illustrated in the sectional views, Figs. 4 and 7, to allow the proper clearance for the face of the cutting blade, and the ends of the blade A (shown in Fig. 5) are bent in opposite directions to provide a side tool adapted for special purposes or the ends may be deflected in the same direction as illustrated by the dotted lines.



NEW LATHE TOOL.

In Fig. 8 is shown a flat cutting-blade A, adapted for cutting a screw-thread. The upper and lower edges of the cutting blade and the strengthening plate may be at right angles with the sides so that a right or left-handed screw could be cut with the one tool. Fig. 10 is a cutting-off tool; the two sides of the blade A being beveled to a wedge shape so that the cutting edge has due clearance. In this case the side of the plate B, which faces the cutter A, is beveled sufficiently to place the cutter in an upright position and thus divide the clearance between the two sides.

One feature of the device which is duly noted by the inventor is that the two parts, the blade A and the reinforcing-plate B, are made of the same width or height in every case, allowing the tightening screw of the tool post to bear upon both pieces.

The whole thing is of so simple a form that it may arouse some inquiry as to how far invention is indicated by its design and it may be held by the critic to exhibit nothing more than that adaptation which would naturally occur to any mechanic in the ordinary pursuit of his trade. Be that as it may, a patent has been duly granted to George S. Vanstone of Providence, R. I., on this construction of a lathe tool.

The Stowell Manufacturing & Foundry Co., South Milwaukee, Wis., has completed the erection of a 25-ton annealing furnace, and is erecting another of 50 tons capacity. The company's new malleable iron foundry is in operation.

Modern Machine Methods.*

BY H. F. L. ORCUTT.

There is a rapidly-increasing tendency to minimize hand labor, and to reduce manufacturing to purely machine operations, by the aid of accurate tools and fixtures combined with properly adapted machines. Admitting this, it follows that the lines on which manufacturers will work in the future will mainly be in the direction of perfecting methods of machining.

It is with respect to machine operations, where accuracy combined with cheapness of product is secured, that this paper deals, contrasting modern developments with those methods where accuracy is secured only by laboriously expensive hand-work, or where machine work is performed on tools of comparatively simple design, unaided by highly-developed tools, fixtures, and gages. It is not, however, assumed that automatic machine operations are invariably more economical than hand-work, as doubtless many a sadder and wiser manufacturer who has invested in complicated expensive machines can testify. It is, however, beyond dispute that the producing power of the individual, aided by the labor-saving automatic machine, is practically unlimited, whilst we have long since reached the limit of production of the skilled worker, making use of only simple machines and hand tools. A high degree of accuracy is possible by either the old or the new method; but accuracy combined with cheapness is only possible under new conditions, whilst interchangeability is commercially impossible, except in those establishments fitted with the best machines, tools, and gages.

Strictly speaking, there are few, if any, mechanical operations that may be called new since the time when the planer and milling machines superseded the chisel, and the power lathe and the drilling machines replaced the bow-stick. Turning, milling, planing, grinding, and boring are as "old as the hills." It is the latter-day developments of these operations in which the progressive manufacturer is interested; developments which have practically taken place within the last twenty years, some of them within the last five years. It is proposed to touch briefly upon the different methods in respect to the latest practice only, and to finally deal with the workshop reforms which in some cases follow, and in others must precede, the introduction of new methods, before such methods can be successfully adopted.

The range of subjects is so large that in most cases ambiguity has been risked for the sake of brevity. Descriptions of methods of working have not been possible, and an attempt only has been made to mention the most important points to which modern manufacturers must give attention. Technical details as to constructive features of machines have been avoided.

Employment of Accurate Gauges.

It is altogether too commonly supposed that the extensive use of accurate gauges is only economical where either highly accurate work is called for, or parts are to be made in large quantities. Neither supposition is correct. In nine cases out of ten, where even only one piece is concerned, that piece can be produced more cheaply and better with the aid of proper gauges than by the old-fashioned method of "fitting," or by measuring with micrometers or calipers. There will be the additional advantage of pieces being practically interchangeable. Again, where comparatively coarse work—as, for instances, in some parts of a loom—is permissible, the use of suitable gauges is desirable for the reason that, no matter how loose the fits may be, they are necessary to save work in erecting, to secure interchangeability, and to keep sizes within certain limits. All this can be accomplished by means of the "limit" gauge, whether used for large or small dimensions, for inside or outside work, or for running or driving fits. Although the "limit" gauge in certain forms has been in use for years, particularly amongst gun and small-arms makers, it is surprising how little its advantages and use are known and understood by manufacturers for every day work of all sorts. It is impossible to enumerate or describe the forms of "limit" gauges which can be adopted in nearly all engineering works; but manufacturers will find the subject well worth investigation.

*Paper read before the Institution of Mechanical Engineers, at London.

When the advantages of working with limit gauges are better understood, the system is sure to be extensively adopted for general engineering purposes, and limit gauges will supersede, except in a few cases, the ordinary plug and ring gauges. Even where the best gauges, of the ordinary sort, are used, work is in reality finished within certain "limits." When only standard gauges are used, however, these limits are never known; dimensions are made in accordance with the skill, judgment, or experience of the workman. With the limit gauge system it is only necessary to determine what the allowable limits are to be, and to then make use of a maximum and minimum gauge, by which sizes are kept within the prescribed limits. For inside cylindrical work the form of gauge used is shown in Fig. 1; for outside work those shown in Figs. 2 and 3. With these gauges comparatively unskilled labor will (aided by the proper outfit) quickly learn to produce work accurate within limits of 0.0006 in. when using the external limit gauge, and within limits of 0.0016 in. when using the internal limit gauge. These limits are none too close for a large percentage of ordinary engineering work, and close enough for interchangeability, even in fine machine work. The adoption of limit gauges is in itself desirable, but, of course, the most economical results cannot be secured without also giving consideration to the outfit of machines and tools. It does not follow the grinding is necessary, either for inside or outside work. The above limits can be kept to either in lathe or screw-machine work, and holes can be finished in steel, brass, or cast iron with reamers.

It is an erroneous idea to suppose that because comparatively rough work is in question, comparatively rough gauges are "good enough." This may be true, as in the case of working gauges for unfinished material, but it will rarely be found profitable to follow this principle where machined surfaces are to be dealt with. Carefully-finished hardened gauges, accurate to within 0.0001 in., are none too good where working surfaces are in question. A finer degree of accuracy than this is not demanded, except in comparatively small work, as, for instance, in tools connected with the manufacture of watches, It is proved that 0.0001 in. is a limit to which hardened gauges can be made without too great an expense. It is desirable not to go below this degree of accuracy for working gauges (never in the case of standards), as errors multiply rapidly, and four or five times this limit means that in many cases work must be rejected.

The following Table I., of limits given, is one which is adapted to a large range of work:

TABLE I—INTERNAL AND EXTERNAL LIMIT GAUGES.

Limits of tolerance expressed decimally in inches.
Internal Limit Gauges.
(See Fig. 1.)

Diameter of Holes (Nominal).	Go In.	Not Go In.	Total Limit of Variation.
in. in.			
¼ to 1/2	—0.0004	+0.0004	0.0008
7/16 " 1/2	—0.0006	+0.0004	0.0010
1/2 " 1 1/16	—0.0006	+0.0006	0.0012
1 ¼ " 1 7/16	—0.0008	+0.0006	0.0014
1 1/2 " 2 1/16	—0.0008	+0.0008	0.0016
3 " 4 1/16	—0.0010	+0.0008	0.0018

EXTERNAL LIMIT GAUGES, FOR RUNNING FITS.
(See Fig. 2.)

Diameter of Shafts (Nominal).	Go On.	Not Go On.	Total Limit of Variation.
in.			
¼ to 1/2	—0.0004	—0.0010	0.0006
7/16 " 1/2	—0.0006	—0.0012	0.0006
1/2 " 1 1/16	—0.0008	—0.0014	0.0006
1 ¼ " 1 7/16	—0.0010	—0.0018	0.0008
1 1/2 " 2 1/16	—0.0012	—0.0020	0.0008
3 " 4 1/16	—0.0014	—0.0024	0.0010

EXTERNAL LIMIT GAUGES, FOR KEYING FITS.
(See Fig. 3.)

Diameter of Shafts (Nominal).	Go On.	Not Go On.	Total Limit of Variation.
in.			
¼ to 1/2	+0.0004	—0.0002	0.0006
7/16 " 1/2	+0.0004	—0.0002	0.0006
1/2 " 1 1/16	+0.0004	—0.0002	0.0006
1 ¼ " 1 7/16	+0.0004	—0.0004	0.0008
1 1/2 " 2 1/16	+0.0004	—0.0004	0.0008
3 " 4 1/16	+0.0004	—0.0004	0.0008

Light Milling.

The field of operation for the milling machines has materially widened within a comparatively short time. Improvements in design and increased skill in the manipulation and care of tools are the two factors mainly responsible for its success. It has largely displaced the planer and shaper; it produces highly finished and accurate surfaces, and makes substantial savings in hand labor; it is designed with a view to adaptability in making short runs. In many cases it is found profitable to set up a machine for a run on ten or a dozen parts. Stability and quickness of manipulation are the chief characteristics of the modern milling machine, as compared with those of older design. Wherever it can be adopted it usually scores over the planer or shaper as a labor-saver, for the reason that in nearly all cases it can be served by unskilled attendants, who can keep from two to four, and even six, machines in operation; whilst with the planer or shaper it is not very often the case that one operator can advantageously attend more than two machines.

There are three essentials to economical results in milling:

1. Up-to-date machines.

2. A not-too-niggardly supply of good milling cutters and tools.

3. Good tool-makers who know how to keep machines and tools in the best condition.

The following may be mentioned as a few of the most interesting milling operations, which are not as widely adopted as they will be when their advantages are better understood:

The vertical milling machine, or, what amounts to the same, the horizontal machine, performing operations with the end mill, produces in many cases very satisfactory results, both in speed and accuracy. There is a good variety of excellent machines, both of the vertical and horizontal type, now on the market for this class of work. A most valuable machine, comparatively little used, is a combined vertical and horizontal machine with long table. For taking roughing-cuts with fast feeds, inserted tooth cutters with Mushet blades give good results.

Circular Milling.

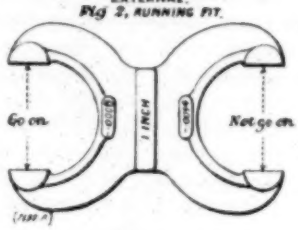
The circular mill, either on simple or complicated forms, effects great savings, and one attendant can keep six machines in operation. It can also be run in connection with other milling machines, reducing costs in many cases 50 per cent and 75 per cent, and competing with the best turning machines in accuracy as well as in costs of operation (see Fig. 4). On castings with a chemical composition suitable for change gears, pulleys, handwheels, and similar parts, circular milling is accomplished with the cutter running at a surface speed of over 50 ft. per minute, and work feeding 4 in. per minute on the periphery.

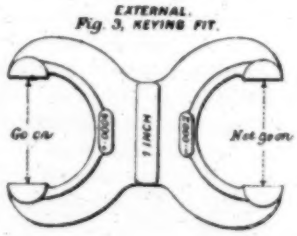
One of the simplest and most effective methods is neglected to an astonishing degree, even by those who have large milling equipments; that is, taking a roughing and then a finishing cut, not hurrying the machine too much on the finishing cut. The milling machine is too often regarded as a means for merely removing metal instead of an instrument for producing accurately finished surfaces where little or no hand work is necessary. In many cases, five minutes more on the machine would make a saving of ten minutes fitters' work, files would be saved, and greater uniformity secured. It should not be forgotten that the wrongly designed, badly made, rarely sharpened milling cutter largely assists in keeping the milling machine in disrepute, when otherwise it might rise to the rank of a valued ally.

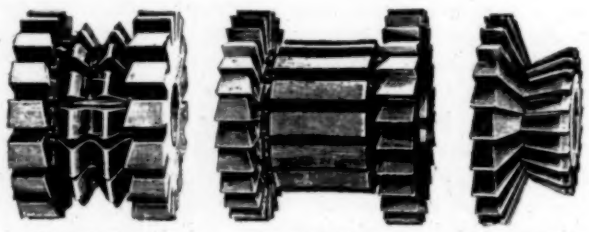
The adoption and profitable use of the milling machine is often impossible, on account of the lack of exact knowledge as to the composition of cast iron, and for want of proper treatment of castings for the removal of sand and scale. A large percentage of castings which are used could be soft if cupola mixtures were properly regulated. This would allow fast speeds and feeds for the milling cutters, without planer or too much wear, instead of the comparatively slow planer cuts where castings are hard. There is little comprehension of how much the want of laboratory work stands in the way of the adoption of the milling machine. The pickling of castings alone makes it possible to increase the product of milling and planing machines, saves cutting tools, and consequently makes good work easier. Milling in many cases easily reduces costs 50 per cent. when compared with planing.

Heavy Milling.

The anticipated annihilation of the planing machine is not yet a reality, as some milling machine enthusiasts have from time to time predicted; and for heavy work the honors are now fairly well divided between the miller and the planer. Where rough but comparatively true surfaces only are required, what is known as the rotary planer turns out remarkably cheap work. It has the advantages of requiring little attendance, and of turning out work two or three times faster than the planer; the cutters used are mostly of the inserted-teeth pattern, with self-hardening steel. Another profitable use to which the heavy mill has been put is in "roughing-out" work, particularly on castings which are to be accurately finished afterwards on the planing machine. The author has known cases where this operation effected a saving of 75 per cent in time. The rate of feed which can be commonly made use of varies from 2 in. to 6 in. per minute. One particular







Rope Pulleys. Belt Pulleys. Bevel Wheels.

FIG. 4.—BUILT-UP FORMED CUTTERS FOR CIRCULAR MILLING.

case which he has in mind as an illustration of profitable milling is that of roughing out lathe-beds. The cutter is, perhaps, 23 in. wide, and removes from ¼ in. to ½ in. of metal with a feed of about 2½ in. per minute, the peripheral speed of cutter being about 45 in. per minute. Lathe-beds are roughed out in this manner at about a fourth or a third of the labor cost when done on the planer. In this case the beds are afterwards allowed to stand about two weeks to "season"; then a light finishing-cut is taken by the planer, and then they are ready for being scraped. The regularity of cut varies, of course, with the material, whether it is hard or soft, accurate to size or not, or whether sand has been thoroughly removed from castings. Pickling and compositions of castings, of course, largely affect the possibilities of heavy as well as of light milling. Splendid results of heavy milling are attained by taking roughing and finishing cuts; surfaces of complicated shape up to 20 in. to 24 in. in width are finished outright on the heavy mill, and are then ready for being scraped. Good gains are made over the planer, in some cases, even when on short runs. Cutters are sometimes expensive, even costing

25*l.* and 30*l.*, and often more; but they are good investments as labor-saving tools. The variety of heavy milling machines now on the market is large, so that good selections can be made for all classes of work.

The adoption of the milling machine is not as extensive as it should be, for the reason that often an apparently formidable investment in cutters is necessary. The milling cutter, however, should be looked upon as any other labor-saving tool. It is not much a question of how much does it cost as how much does it save, or how much does the article cost which it turns out.

Improvement in Planer Practice.

The planer is a much neglected, long-suffering machine, too often found in such dismal, unfavorable quarters that any attempts to improve either the accuracy or quantity of its product would be of little avail. Daylight and good foundations are commonly wanting in the planing department. Most of the improvements connected with the latter-day practice in planer work are seemingly of little importance, but when added together give a substantial total. They can be briefly enumerated.

A quick return stroke is a feature of all up-to-date planers. This is now rarely less than three to one on machines up to 36 in. capacity, and on smaller sizes four to one is common. Where castings are of good quality and the machine is well designed, cutting speeds are maintained of from 25 ft. to 30 ft. per minute, and even up to 40 ft. Where castings are hard, either through design or ignorance, cutting speeds are necessarily lower. There is an immense amount of planing being done at cutting speeds of from 12 ft. to 18 ft. per minute which could be done at a rate of from 20 ft. to 25 ft. All planers of 24 in. capacity and upwards should have two heads, and larger sizes three and four. One of the most highly-productive planers the author has seen is a 24-in. machine with four heads and a 24-ft. bed; it runs a close race with fast milling machines. It is claimed by a well known machine-tool manufacturer that good savings are effected by the use of variable-speed countershafts with which all their planers are fitted, as they can vary the speed of planers at will, in accordance with the quality of material, length of stroke, and depth of cut. The author has seen in but one shop a simple device which saved considerable time; it was a brake in the form of a wooden shoe, which pressed on the fast-running countershaft pulleys when the belt was thrown off. All the best types of planers are quickly manipulated by an easy working lever, by which the machine can be started, stopped, or reversed. Few planer hands, realize the time saved by good holding devices, dogs, wedges, and quickly adjustable blocking pieces. Where any quantity of parts are to be planed, properly arranged jigs are of as much importance as for the milling machine. Block templates which clamp to planer beds are extremely useful devices for complicated shapes.

Electric chucks for thin parts are the latest and most useful innovations. An exceedingly simple and useful little tool is the block gauges. It is cheap, lessens the chances of mistakes being made in measuring, and saves time in setting tools. The practice of periodically levelling the planer beds is astonishingly neglected, yet it is absolutely essential for good work.

The magnetic clutch driving mechanism promises to be a most important improvement in planer construction. This consists essentially of two magnetic clutch discs, which are revolved in opposite directions and at speeds corresponding with the forward and return stroke of the planer table. The current is automatically switched by dogs on the table to either one clutch disc or the other. They alternately attract and grip discs connected by a sleeve, and which slide endwise on the driving shaft of the planer to which they are keyed. Reference to drawing will show that these discs are so made that flywheel effect is reduced to a minimum. This arrangement makes it possible to reverse a planer table with a motive power very little in excess of that required to drive it. With the ordinary belt drive the amount of power consumed at the moment of reversal is from 75 to 100 per cent in excess of that necessary to move the table when under cut; whereas with the Riddell electric clutch drive on an 84-inch planer the increase in power is only about 15 per cent. The mechanism is practically noiseless, and reverses more accurately to a line than with a belt drive.

Grinding.

Grinding is probably the most ancient of all mechanical operations. As an operation by which accurate surfaces are cheaply produced, it is, however, a development of the last few years. The plain and universal grinding machine, in its latest form, is now a manufacturing machine as much as the lathe or milling machine; its use is no longer restricted to the "tool room," or for finishing hardened parts. It is conceded by those who use the grinder extensively, and are expert in manipulating it, that it is the cheapest as well as the best machine for producing, mechanically, correct cylindrical surfaces where good work and interchangeability are desirable. This is true respecting soft as well as hard steel, cast iron, or bronze. The turner and the file cannot compete with the grinding machine and the limit gauge. The author believes it is safe to state that (excepting in heavy work) the grinding machine and the turret lathe will in the near future absorb 50 per cent of the lathe work now performed by skilled turners. Parts can be roughed out on lathes by unskilled attendants, each running from two to three lathes, allowing from 0.006 to 0.008 on parts up to 4 in. in diameter for finishing, and then accurately finished almost to the nicety of a gauge on grinding machines, one operator keeping two of these machines at work. For good cylindrical grinding, machines of extreme stability are necessary to resist vibrations; they must be of the very best workmanship, and capable of handling a large stream of water by which the work is kept at an even temperature. Accurate limit-gauges are of great assistance as measuring instruments in the grinding department, for they can be more readily used in many instances than micrometers or vernier callipers.

Surface grinders, where accuracy is necessary, are not much used, except where comparatively small areas are in question. Where accuracy is not of much importance they will be found effective for a great deal of work, and more economical than hand polishing. One man can keep from four to five machines in operation. They are best when arranged with exhaust-pipes for removing dust, as the present machines are not constructed to be used with a stream of water. As with planers, electric chucks are again "the latest" and most useful accessories to surface grinders.

Where accuracy is required on flat surfaces, except those of small dimensions, nothing in the way of a machine operation has been devised to take the place of hand scraping, or, where hardened surfaces are in question, hand lapping.

The most striking example of advanced practice in cylindrical grinding is that of work recently done on a machine capable of finishing parts up to 18 in. in diameter and up to 8 ft. long, carrying a grinding wheel 24 in. in diameter with a 2-in. face. It is recorded that a 4-in. shaft 3 ft. long can be finished on this machine in six minutes. The shaft is first rough-turned with a 12-per-inch feed, and left 0.01 in. above size at the bottom of the tool marks. Parts up to 7 in. diameter are rapidly finished, the limit of variation being 0.001 in. Knowing that results like the above have been accomplished, few manufacturers can neglect to seriously consider grinding as an important method by which costs may be reduced and quality of work improved.

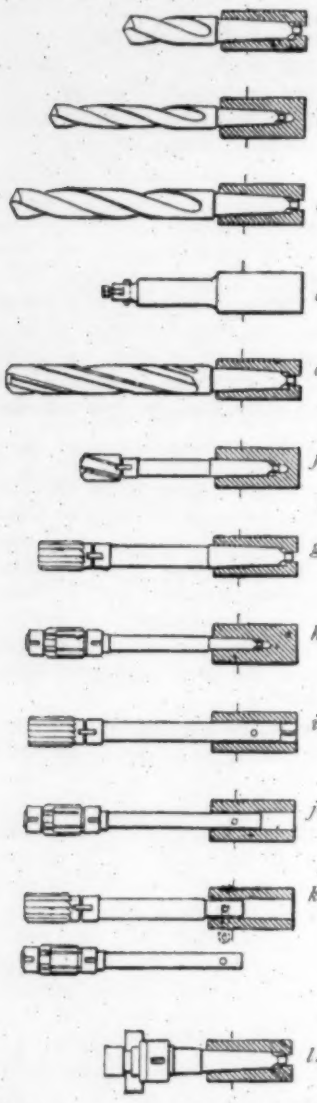
Chucking.

"Chucking" is an American term used to designate that class of work in which the part is held in a face-plate chuck in either a vertical or horizontal turret machine, and is operated upon by a series of tools which finish a cylindrical hole. Comparatively true cylindrical surface, cheapness of operation, and interchangeability, are virtues sufficient to recommend a proper system of chucking to enterprising manufacturers. Its adoption in accordance with the best practice need not be restricted to those who only make in large quantities or turn out very close work. Whether there is one piece or 500 to be "chucked," whether the "fit" has 1-64-in. or 2-1000-in. play, the system is profitable. In the same manner that milling is specialized to secure accurate flat surfaces at a low cost, so is "chucking" specialized for the purpose of securing accurate cylindrical holes with comparatively unskilled machine attendants. "Chucking" machines, with proper outfits of boring tools, are as much a part of a modern engineering equipment as are milling machines with their outfit of cutters and arbors. One prominent English manufacturer told the author

that the introduction into his works of a chucking department revealed the fact that he had never before made holes that could be called round. The best system calls for a series of tools, usually varying in number from four to six for each diameter, the final operations in most cases being performed by an adjustable reamer, which takes out about 0.004 in., all holes being tested by the inside limit gauge (Fig. 1).

For cast iron, when parts are not too light weight, the vertical machine is best adapted. One operator can in most cases attend two machines. Other operations, such as facing and turning, are often to advantage combined with chucking work. For steel work, where oil is used, and light parts or parts with a long hole, the horizontal machine is better adapted. As in many other operations which are specialized, comparatively unskilled labor can be employed; but the highest skill is required to supervise and keep machines and tools in proper working condition. The tools ordinarily used consist of under-size twist-drills, boring tools, three-lipped chucking drills, four-lipped boring tools, roughing reamers, finishing reamers (adjustable), and facing tools; a part or all of these may be used, in accordance with the work and available machines. The best shop organization demands a department equipped with chucking machine, tools, and gauges, to which every part within the scope of the department should be sent. The results are a reduction in the costs of boring, a higher degree of accuracy, and the attainment of interchangeability.

With a proper outfit, holes up to 3 in. diameter can be easily finished by comparatively unskilled workmen, to within from 0.0005 in. to 0.0010 in. of standard size.



a. Short and strong twist drill for centering.

b. Roughing drill.

c. Roughing drill.

d. Boring tool.

e. Three-lipped chucking drill. ½ in. to 2 in.

f. Four-lipped boring tool. 1⅛ in. to 4 in.

g. Shell reamer. 1⅛ in. to 4 in., with shell reamer arbor.

h. Adjustable reamer. 1⅛ in. to 4 in.

i. Shell reamer. 1⅛ in. to 4 in., with shell reamer arbor.

j. Adjustable reamer. 1⅛ in. to 4 in.

k. Shell reamer. 1⅛ in. to 4 in., with shortened shell reamer arbor, also adjustable reamer. 1⅛ in. to 4 in.

l. Facing tool.

CHUCKING AND BORING TOOLS.

For Vertical Chucking Machines with Four Holes in Turret—1. For chucking from the blank: *a. c. i. j.*, or *b. e. i. j*, or *a. b. e. k.*, or *a c. k. l.*, or *b e. k. l.* 2. For chucking cast holes: *d. f. i. j.*, or *d. e. i. j*, or *d. f. k. l.*, or *d e. k. l.*

For Vertical Chucking Machines with Five Holes in Turret—1. For chucking from the blank: *a b e i j*, or *a. c. i. j. l.*, or *a. b. e. k. l*, or *b. e. i. j. l.* 2. For chucking cast holes: *d f. i. l.*, or *d. e. i. j. l.*, or *d. f. k. l*, or *d e. k. l*

For Horizontal Chucking Machines with Four Holes in Turret—1. For chucking from the blank: *b. e g. h.*, or *c g. h. l*, machines with rest. 2. For chucking cast holes: *d. e g. h.*, or *d f. g. h.*, machines without rest: *e. g. h. l*, machine with rest.

For Horizontal Chucking Machines with Six Holes in Turret—1. For chucking from the blank: *a. b. e, g. h. l.*, or *a. c. g. h. l.* 2. For chucking cast holes: *d. e. g. h. l.* or *d. f. g h. l.*

Turning.

The lathe has been and will continue to be one of the most important machines in the equipment of an engineering establishment. The principal improvements in design to be noted in the modern lathe are quickness, ease of manipulation, and rigidity. There is also a growing appreciation of the value of a lathe possessing the best quality of workmanship, even when used for comparatively rough work. Referring particularly to light lathe work, recent developments in other machine tools have taken away from the lathe a large amount of work for which it was formerly thought that the machine was indispensable. Except in special cases, the boring of holes is now largely relegated to the chucking department. The accurate finishing of plain parts, and, in many cases, of parts of considerable complication, is done in the grinding department. Where repetition, even of small quantities, is possible, parts up to 2 ft. long and 2 in. in diameter, are sent to the turret machine department. It is now recognized that it is poor economy to make a polishing bench of a fine screw-cutting engine lathe. It seems pretty well assured that in the future the lathe will be largely used as a roughing-out machine. Following this line, a great deal of work can be done by unskilled labor, one man keeping two or three lathes in operation. Stiff lathes, fitted with double tool-post and with pumps and pans, so that the work can be flooded with soapy water, are found to be as a means of reducing parts much cheaper than smith work. For instance, soft machinery steel spindles can be reduced 3½ in. in diameter at one operation by means of two cutting tools, which would have a feed of about 0.007 in. per tool. Table II. is interesting, as showing possibilities in this direction.

It is in many cases one man working three pieces in the lathe department *versus* three men working on one piece in the forge shop. All the modern innovations which are either supplanting or improving lathe work, such as chucking, grinding, screw-machine work, polishing and roughing, are accompanied by a reduction in costs of manufacturing, the employment of less skillful machine attendants, an increase in the number of machines that one man can attend, and better work. It should be mentioned that the various processes of treating turning tools may revolutionize lathe construction. Speeds, feeds, and strains must all be recalculated. Cutting speeds from 80 ft. to 120 ft. per minute are now quite common. Where the lathe is used for roughing out, from 0.006 to 0.008 is sufficient to leave for finish grinding. Roughing limit gauges are useful for this work.

TABLE II—TOOL SPEEDS FOR CUTTING SOFT STEEL.*

Number.	Material.	Diameter before Turning.	Diameter after Turning.	Depth of Cut.	Revolutions per Minute.	Cutting Speed, Feet per Minute.		Feed per Minute.	Feed per Revolution.
						At Outer Circumference.	At Bottom of Cut.		
		in.	in.	in.	in.	ft.	ft.		
1	Soft machinery steel	5¼	1¾	1¾	27	37.1	12.25	3/16	0.007
2	Ditto	1 9/16	9/16	½	297	121	43.5	1¾	0.006
3	Tool steel	3¼	2¾	⅜	30	29.4	21.5	3/16	0.010
4	Ditto	2¼	1⅝	7/16	45	29.4	20.25	7/16	0.010

Number.	Material.	Original Diameter.	Depth of Cut.	Revolutions per Minute.	Cutting Speed, Feet per Minute.	Feed per Minute.	Feed per Revolution.	——
		in.	in.		ft.			
5	Cast iron	4¼	⅛	37	41	3⅛	0.085	Roughing cut
6	Ditto	4¼	1/32	100	111	3½	0.035	Finishing cut
7	Soft machinery steel	4¾	3/32	23	28.5	1⅞	0.081	Roughing cut
8	Ditto	4¾	1/32	63	78	2½	0.04	Finishing cut

* *American Machinist*, Sept. 29, 1900.

A summary of the latest practice in connection with lathe-work would include the following:

1. Chucking or boring transferred to the turret chucking machine.
2. Finishing transferred to the grinder.
3. Repetition work (even for a dozen pieces) transferred to the screw machine.
4. Polishing transferred to a separate department.
5. A great deal of forge work transferred to the roughing-out lathe.
6. Castings like handwheels, flanged or grooved pulleys, bevel-wheels, etc., transferred to the circular milling machine.
7. A great increase in cutting speeds.

Polishing.

The establishment of a polishing department is apparently a custom more honored in the breach than in the observance by most engineering works, even where this work could be specialized to good advantage. A well-arranged polishing department is one of the best examples of simple organization that could be selected, for the reasons that its equipment is cheap, costs of operations are reduced, and quality is improved. This work only needs to be classified. Let any manager walk about his shops, and observe polishing operations going on here and there. It is most probable that they are being done by skilled turners or fitters on expensive machines, when the work could be done by a comparatively unskilled hand with an inexpensive apparatus. A gain would also be realized in time of operation and quality of finish if all polishing was done by men trained by constant practice. The downfall of many an accurate engine-lathe could probably be traced to surplus charges of emery, administered by the combined turner and polisher. A comparatively cheap and simple apparatus for removing dust from the polishing department would probably have the effect of inducing better grade men to become interested in this class of work, which is important both in respect to the quality and appearance of finished parts.

Gear Cutting.

The advocate of cast gears has few arguments, as far as costs are concerned, when confronted by the results of modern automatic gear cutters. Every form of gear-cutting can now be done on automatic machines. One operator can keep from three to five automatic spur machines and from three to ten automatic bevel-gear cutters at work. The latest practice in gear-cutting is really confined to the following latest designed machines; fully automatic spur-gear cutters, with rapid return stroke to cutter spindle carriage and accurate dividing mechanism, which in some cases cut up to five teeth at once; the fully automatic bevel-gear planing machine, and the fully automatic bevel-gear milling machine, which develop theoretically correct teeth (one operator attending up to ten machines); the spur-gear shaper, and the modern rapid-cutting worm-gear cutter, in which the taper hob is used. Accurate cutters are comparatively cheap; means for testing the accuracy of finished gears are simple and cheap, but are not often seen in modern shops. Even in large shops this department is not sufficiently specialized. Gear-cutting is an art, and calls for special study, if accuracy and cheapness are to be combined.

(To be Continued.)

Jas. A. Sanford, Jackson, Mich., designer and manufacturer of special machinery, has completed a number of machines for the Jackson Cushion Spring Co., of that city, and has several more in process of construction. The springs are of the twin type and the machines are said to be capable of turning out in the neighborhood of 3,000 springs in ten hours.

The Woodstock Iron Co., Anniston, Ala., has let contracts for the additions and improvements to its furnaces, as follows: Boilers, Walsh & Whilton Foundry Co., Chattanooga, Tenn.; castings, Caldwell-Watson Foundry Co., Birmingham, Ala.

The Whiting Foundry Equipment Co., Harvey, Ill., has received an order from Manchester, England, for a complete foundry equipment.

AMERICAN IRON AND STEEL MFG. CO.

The annual meeting of the American Iron and Steel Mfg. Co., of Lebanon, Pa., was held on February 12, and officers were elected as follows, for the coming year: J. H. Sternbergh, president and general manager, Reading, Pa.; H. M. Sternbergh, vice-president, Reading, Pa.; James Lord, manager, Lebanon plants, Lebanon, Pa.; H. M. M. Richards, treasurer, Lebanon, Pa.; C. M. Hallman, secretary, Lebanon, Pa. In addition to the above the directors are Edward Bailey, Arthur Brock, Horace Brock, Thomas Evans, H. H. Light, Wm. H. Wallace. The treasurer's financial statement for the year ending Dec. 31, 1901, is as follows:

ASSETS.

Plant and equipment	$3,597,846 73
Inventory of finished goods and raw materials on hand, valued at less than present market prices	1,269,839 88
Cash on hand and in bank	104,169 02
Accounts receivable	512,784 98
	$5,484,640 61

LIABILITIES.

Preferred Stock	$3,000,000 00
Common Stock	1,700,000 00
Accounts payable, including wages to Dec. 31	600,322 82
Undivided profits	184,317 79
	$5,484,640 61

The total of dividends paid in 1901 was $337,000—four dividends on the preferred and three on the common stock. The report of President Sternbergh to the stockholders contains among other statements these which are of general interest:

"During the calendar year 1901 this company manufactured 117,661 net tons of bar iron and steel. Of this quantity we sold 36,469 net tons merchant bar iron, and of the remainder we manufactured and sold 62,106 net tons of miscellaneous finished goods, bolts, nuts, rivets, etc. Our total sales of all products for the year amount to $4,754,560.36. We have sold the real estate and buildings of our North Reading Works, and shall move most of the machinery to Lebanon and concentrate more of our work at this point.

"We are glad to state that we are realizing many of the advantages anticipated when our constituent companies consolidated in August, 1899. Referring to our financial statement, we beg to explain that ordinary repairs and renewals of building and machinery are charged monthly to 'Operating Expenses,' and new construction to 'Plant and Equipment.' The company's credit is first-class. We pay for all of our purchases promptly, and discount our bills whenever possible.

"We are obliged practically to rebuild much of our Central Works, including the erection of a new nut shop 201 x 184 feet, a new bolt shop 201 x 150 feet, an additional warehouse 300 x 70 feet, an electrical power and pumping plant 95 x 60 feet, a water tower 20 feet diameter, 70 feet high, a pattern storage warehouse 107 x 50 feet, a new bolt threading shop 200 x 74 feet, a galvanizing shop 106 x 40 feet, a new scrap iron shed 230 x 80 feet, and other buildings, besides the complete rearrangement of railroad tracks through the grounds for the more econoimcal handling of materials, and the substitution of modern steam boilers and furnaces for the less efficient types heretofore used, and, in general, the repairing of nearly all the engines and bolt and nut machinery at the Lebanon Works. Much of this work has already been done, and when all of the above improvements are completed we shall be able to execute our orders much more satisfactorily and economically."

An 8-page booklet has been prepared by Wyman & Gordon, makers of drop forgings, Worcester, Mass. It contains a short and appreciative essay upon the pioneer James Watt. The text is illumined by a half tone of the subject, taken from a bas relief (drawn up by hammering a sheet of bronze) found in New York. The compilers of the present publication have another one in hand, which is to deal with Matthew Boulton, the little known but essential personality, at once the craftsman and commercial power, who was Watt's partner. Messrs. Wyman & Gordon are to be congratulated upon a very pleasing variation from the hackneyed form of trade publications.

A YEAR'S OPERATIONS OF THE PATENT OFFICE.

The report of the Commissioner of Patents, F. I. Allen, for the year ending Dec. 31, 1901, has just been issued, and it appears from the tabulated matter that during that period there were received 43,973 applications for mechanical patents, 2,361 applications for design patents and 115 applications for reissues of patents. There were 27,292 patents issued, including designs. The number of patents that expired was 19,147 and the number of allowed applications awaiting the payment of final fees was 8,369. The number forfeited for nonpayment of the final fees was 4,111. The total expenditures were $1,297,385.64. The excess of receipts over expenditures was $152,012.52 and the total balance to the credit of the patent office in the treasury of the United States on Jan. 1, 1902, was $5,329,471.07.

In proportion to population, more patents were issued to citizens of Connecticut than to any other state—1 to every 1,198. Next in order are the following: District of Columbia, 1 to every 1,296; Massachusetts, 1 to every 1,472; New Jersey, 1 to every 1,572; Rhode Island, 1 to every 1,581; Colorado, 1 to every 1,718; New York, 1 to every 1,773 and so on through the list of states and territories to Alaska territory, 1 to every 31,796 and South Carolina, 1 to every 28,517 inhabitants.

As to foreign patents, 1,045 were granted to residents of Germany; 986 to those of England; 376 to those of Canada; 306 to those of France; 156 to those of Austria-Hungary; 56 to those of Switzerland; 55 to those of Scotland; 54 to those of Belgium; 53 to those of Sweden; 37 to those of Italy; 35 to those of Victoria; 30 to those of Denmark and 29 to those of Russia.

The patent office issued 27,373 patents (including 81 reissued) during the year 1901, the largest annual issue in its entire history.

The commissioner points out that one hundred and twenty-eight examiners and assistants out of a force of two hundred and nineteen are working overtime to keep up the work of their divisions. The number of examiners should be increased to provide properly for this situation, which operates unfairly against a skilled body of employes of the government and which may be reasonably expected to grow worse by the growth of the business of the bureau in accordance with the general growth of the industrial arts of the country, of which it is an index.

Already the work of classification has become a considerable part of the work of the office and requires the continuous employment of a force of twelve examiners and fourteen clerks. The value of this work is already manifest, and it should be allowed to proceed faster by the assignment of more assistants to this division. The fact that over seven hundred thousand patents have been issued by the government is enough to suggest the truth that classification is a necessary thing if the system of examination of applications upon the question of novelty is to continue.

The commissioner recommends that there should be furnished the following additional force, viz: three principal examiners, of whom one shall take the place of an assistant now at the head of one of the examining divisions and the other two shall have charge of two new divisions to be formed. The following assistant examiners will be required: four first assistant examiners, eight second assistant examiners, ten third assistant examiners, and ten fourth assistant examiners. This force will go in part to supply the twenty places now represented by overtime work in these divisions and will also replace eleven acting assistant examiners who are drawn from grades of employes not expected to perform such services and whose services can then be used in lines of work for which they were originally intended and which need them. It will also permit more rapid progress in the work of classification.

The balance in favor of the office for the calendar year 1901 amounted to $152,012.52, and if a portion of this could be expended in increase of force it would only meet the existing necessities of the work of the bureau.

During the year 1901 changes have been made in the methods employed in receiving, opening, examining, and recording the mails of the office and its cash contents. These changes were made upon the discovery of irregularities within the office, which resulted in some changes in the personnel, and they have now been in force for five months. The result has been an almost complete cessation of complaints of losses of money alleged to have been sent to the office. The scientific library of the office contains about seventy-six thousand volumes, and it is the best scientific library in this country. The sum of $5,000, which was provided by congress for the installation of steel stacks for its use, has been employed for this purpose, the library having been given new and enlarged quarters, and it now appears that the further sum of $2,500 will enable this work to be completed, and the increased usefulness and greater safety of the library will justify this further expense to complete this work.

The annual sum of $2,000 provided for the purchase of books is insufficient to furnish all that are required for the purposes of this library, and small as this sum is, about $500 has been taken from it annually to pay the expenses of transporting publications of patents issued by the office to foreign governments. This custom is of long standing, and it is recommended that the library should receive $4,000 per annum for purchase of books alone to enable it to serve the purposes of examiners searching the arts in their respective classes.

Republic Iron and Steel Co.'s Raw Material.

In his recent report to the stockholders of the Republic Iron and Steel Co., President A. W. Thompson refers to the expenditure since May 1, 1899, of $1,946,062.85 in reconstruction, improvements, renewals and repairs. In addition to this amount the balance sheet shows that since May 1, 1899, the company has invested $3,618,610.19 in entirely new construction. On the subject of ore and coke supply and the resources of the Birmingham district, the report says:

"When this company was organized, on May 11th, 1899, its ore supply for Bessemer mixture, by the acquisition of ore mines, consisted of two and one-half million tons. Since that date the company has acquired, by contracts extending over a period of years, by fee, and favorable leases, 11,500,000 tons additional, making a total supply of more than 14,000,000 tons, or sufficient for the requirements of our northern blast furnaces for a period of twenty-eight years.

"We have a sufficient acreage of Connellsville coking coal to supply our Northern blast furnaces for a period of twenty years. This supply of ore and coke places the company in a strong position to produce Bessemer and forge pig iron at the lowest possible cost.

"In Alabama the company owns 70,000,000 tons of ore and 50,000,000 tons of coal, mostly in fee, together with ample quantities of limestone, all within a switching distance of three blast furnaces at Thomas, Ala., which have a daily capacity of 650 tons of basic, foundry and forge pig iron. This ore, coke and limestone will cover the requirements of double the present capacity for more than fifty years. The company produces all of its coke, ore and limestone requirements in this district, and, with three modern blast furnaces, one entirely new, the other completely remodeled since they were acquired by the company, pig iron in this district will be continuously produced at the lowest possible cost."

The American Malleable Iron Co., which recently purchased the plant of the American Malleable Castings Co., at Chicago Highlands, Ill., has removed its Chicago office from the Chamber of Commerce to 343 Marquette Building. The new company is capitalized at $200,000. John H. Palmer, formerly president of the American Rolling Mill Co., Chicago, is president, and Burton H. Smith, secretary and treasurer.

Williams, White & Co., Moline, Ill., report having received orders for three large multiple punches, one multiple wood boring machine, two riveting hammers, three large bulldozers, two board drop hammers, and two crane drop hammers.

John Bruner, superintendent of the bureau of construction of the department of public works of Pittsburg has resigned to accept a position in the structural department of the Illinois Steel Co. Mr. Bruner was formerly connected with the structural department of the Carnegie Steel Co.

PRESIDENT SCHWAB ON EUROPE'S ATTITUDE.

Interviewed at New York on his return from Europe on February 16, President Schwab, of the United States Steel Corporation, said:

"I went away for a vacation, and while I had a delightful trip, I also did a great deal of work. I found a feeling of the utmost friendship for our country existing everywhere in Europe. I found also intense interest in the question of the industrial combines, business men on every hand wishing to know more about them and more about our methods. I have been privileged to meet the greatest men in the European world of finance and manufacture and the great master minds in economic thought. I was surprised and delighted to find such tremendous interest in our great undertaking and with the cordial reception given everywhere to the president of the steel corporation.

"I said in a speech in Chicago that any combination of business enterprises organized for other purposes than the reduction of cost and the increase of output is placed upon a false basis, and I return from my visit to Europe feeling more than ever impressed with the truth of that proposition. I come back with my ideas broadened and my enthusiasm unbounded. Heretofore I have looked upon our great combination of the steel industry of this country as perhaps nothing more than an ordinary business venture of great magnitude, but after hearing the views of the business men of the old world I find that I have, if anything, underrated our undertaking.

"We are now more than ever ready to demonstrate that the greater the scope of the combination the greater the possibilities for economy, and consequently the greater the possibilities for the reduction of cost. With these objects in view we must have our great plants equipped and manned to perfection, and no care or proper expense must be spared to keep those plants modern and at the highest point that ingenuity, skill and enterprise can reach.

"While there exists in Europe the greatest feeling of friendship and admiration for America and Americans, I found also a degree of curiosity and uncertainty as to what we are going to do next. But, as I told them, they have their own protection at home in their laws, and what we are after is trade in the great common field, such as China and the Orient generally. This we want and this we are going to get. In order that we may do so, however, we look to Congress to make provision for the protection of our shipping. We will look after the manufacturing.

"Speaking as the president of the United States Steel Corporation, I wish to impress upon our people here the fact that throughout England and Europe there exists no feeling of enmity among the great men, and my visit abroad this year was notable in the change I found when I, who had been there so often as an individual, presented myself as the president of the United States Steel Corporation, which, as the greatest of American consolidations, was the center of curiosity among inquiring men of all nations, who sought on every hand to learn more of our methods and our plans."

A Fair Though Full Field and No Favors.

The following contains an unexpected answer to a well-worn query, and is, therefore, worth passing along:

"And now what do you propose to take up?"

"Mechanical engineering."

"But is not that profession somewhat overcrowded?"

"I believe it is, but I shall study it just the same and those who are already in the business must take their chances."

The Indianapolis Switch & Frog Co., of Springfield, Ohio, advises us that its works were not destroyed by the fire in the East Street plant in that city on February 10, the loss being confined to a portion of the company's offices. These have been re-established at No. 76 Eastern Ave., Springfield, and the business is going on as heretofore, orders being promptly filled.

The Meeker Av. plant of the American Steel & Wire Co., at Joliet, Ill., will be placed in operation soon. It has been closed for nearly two years.

BLAST FURNACE OPERATIONS.

From the Feb. 10 issue of the *Bulletin* of the American Iron and Steel Association, we have the following information relating to the plans and operations of various blast furnace companies:

The Youngstown Iron Sheet & Tube Co., of Youngstown, O., has not as yet decided to erect a new blast furnace at Haselton, as has been stated.

The Thomas Furnace Co. will blow in its Minerva Furnace, at Milwaukee, Wis., about March 1. The furnace was leased by the Minerva Pig Iron Co. until June 1, 1901, when it was purchased by the present company, which has thoroughly overhauled it.

The Spring Valley Furnace, at Spring Valley, Wis., was idle during the whole of 1901. Operations may be resumed about March 1.

The three Minnequa Furnaces of the Colorado Fuel & Iron Co., at Pueblo, Col., were in operation for 52 weeks during 1901. Bessemer pig iron and spiegeleisen were made. The company is now erecting two new furnaces, to be known as D and E, which are expected to be completed in July and October respectively.

The Irondale Furnace of the Pacific Steel Co., at Irondale, in Washington, blew in late in December after an idleness of several years. Charcoal iron is made.

Alice Furnace, at Sharpsville, Pa., purchased by the Youngstown Iron Sheet & Tube Co., does not pass from Pickands, Mather & Co.'s hands until June 1.

The E. and G. Brooke Iron Co., of Birdsboro, Pa., will blow in one of its two stacks in March. It had one furnace running at the close of 1901.

The Richard Heckscher & Sons Co. had one of its two furnaces at Swedeland, Pa., in blast on December 31. It expected to blow in the idle furnace on Feb. 15.

The Shenango Furnace Co., of Sharpsville, Pa., will blow in one of its two Shenango Furnaces about April 1. With Spearman furnace, acquired Jan. 1, the company has three stacks.

The La Belle Iron Works, of Steubenville, Ohio, are tearing down their old stack and will rebuild it at once. The new furnace will be 90 by 20 feet and will have an annual capacity of 146,000 tons.

The Illinois Steel Co. had eight of its ten furnaces at South Chicago in blast on Dec. 31. One of its two idle South Chicago stacks blew in in January; the other is expected to be ready for blast in April. It also expected to blow in one of its Union Furnaces on Jan. 15; its other Union Furnace ran for 52 weeks during 1901. One of its furnaces at North Chicago was idle on Dec. 31; the other was blowing on the date named and ran for 46 weeks last year.

The Dunbar Furnace Co., Dunbar, Pa., has had but one of its two furnaces in blast for some time. No date is fixed for the blowing in of the other.

The Allentown Iron Works, of Allentown, Pa., are repairing one of their two furnaces and expect to have it in operation early in March. One furnace was running for several months last spring.

The Allentown Rolling Mills, of Allentown, Pa., had one of its two stacks in operation at the close of 1901. Its idle stack will probably be blown in in February.

The United States Cast Iron Pipe & Foundry Co. says that the report that it contemplated erecting two new blast furnaces at Sheffield, Ala., is premature.

The Virginia Iron, Coal & Coke Co. had one of its two furnaces at Middlesborough, Ky., in operation last year. Its idle stack may be blown in in March or April.

The new furnace which the Tube Steel Co. is erecting at Benwood, W. Va., will not be completed until some time next summer. Its size will be 100 by 21 feet.

The Cranberry Furnace Co. has leased from the Virginia Iron, Coal & Coke Co. its blast furnace at Johnson City, Tenn., and expects to have the furnace in blast toward the end of February. Special Bessemer iron, not exceeding .025 in phosphorus, will be made. Ore from the Cranberry mines will be used. The name of the furnace has been changed from Carnegie to Johnson City. William Wilkins is manager.

The plant of the Donaldsonville Foundry Co., Donaldsonville, La., was sold at sheriff's sale last week for $8,600.

OBITUARY.

Thomas J. Bray, aged 62, identified with the tube industry of Pittsburg for many years, died in that city on Jan. 15. He was born in South Wales, Feb. 7, 1836, and located in Cincinnati in 1852. Ten years later he came to Pittsburg and entered the employ of Lewis, Oliver & Phillips, serving for 20 years as master mechanic. He erected the original plant on the site of the Pennsylvania Tube Works, designed the Pittsburg Tube Co., Riverside Iron Works and the Ohio Tube Co. plants, all of which are now connected with the National Tube Co. In 1898 Mr. Bray remodeled the Continental Tube Works, of which he was superintendent at the time of his death. He had two sons, C. W. Bray, chief engineer of the American Tin Plate Co., and T. J. Bray, Jr.

Francis A. Pratt, one of the founders of the firm of Pratt & Whitney ,of Hartford, Conn, died in that city Feb. 10, aged 75 years. Death was due to apoplexy. Mr. Pratt was born in Woodstock, Vt., Feb. 15, 1827. From childhood he had a mechanical inclination that indicated genius. His parents moved from Woodstock, Vt., to Lowell, Mass., when he was 8 years old. At 15 he was apprenticed to the machinist's trade, under Warren Aldrich. In 1848 he went to Gloucester, N. J., where he was employed, first as a journeyman and afterwards as a contractor, by the Gloucester Machine Works. Associated with him in contract work was Samuel Batchelder, who afterwards became connected with the Colt Patent Firearms Manufacturing Company. It was at Mr. Batchelder's request that Mr. Pratt went to Hartford, in 1852, and accepted a position as foreman of Lincoln's Phœnix Iron Works While employed by this company he became acquainted with Amos Whitney, and in 1861 the two engaged in business for themselves. In 1869, under a charter from the State, the company was incorporated with a capital of $350,000, and was afterwards increased to $500,000. Mr. Pratt was president of the corporation, and its leading spirit from the outset. One of the chief products of the firm was a milling machine which was designed by Mr. Pratt, and of which the company sold over 7,000 during its earlier years. Beginning with the manufacture of machine, gun and sewing machine tools, the company gradually extended its lines. In 1893 it was reorganized with a capital of $3,000,000.

In 1870 Mr. Pratt visited Berlin and returned to this country with orders from the German government for gun machinery to the value of $350,000. He made as many as ten trips to Europe in the interest of the firm, receiving orders from England, Germany, France, Austria and Italy, and in all secured foreign orders amounting to over $3,000,000. He was connected with a number of corporations and was a charter member of the American Society of Mechanical Engineers. He is survived by Mrs. Pratt, a daughter and a son, Francis C. Pratt.

William Hopkins, vice-president and superintendent of the Iowa Iron Works, of Dubuque, Ia., died at his home in that city Wednesday evening, Feb. 5. He was born in Glasgow, Scotland, sixty-one years ago last March and grew to manhood in his native town. He learned the trade of boilermaker there and came to this country in 1861, settling in Boston and working in the shipyards. Later he went to Toronto, where he was employed in railroad shops, and to Dubuque about 1864, his first employment there being in the Illinois Central's shops. He became connected with the Iowa Iron Works in 1868, and remained many years as an employe. He built the first iron hull for a steamboat ever built on the Mississippi. It was christened the Clyde. He also built the government torpedo boat Ericsson and the revenue cutter William Windom, both of which were in the West Indian waters during the Spanish-American war. He was the patentee of valuable steamboat machinery and boiler appliances.

Captain Joseph Cornish, one of the oldest mining men in the Lake Superior region, died Saturday, Feb. 15, from pneumonia, at his home in Negaunee, Mich., aged 55. Captain Cornish opened the Queen mines, of Negaunee, now a United States Steel Corporation property.

The Crossman Edge Tool Co. has been organized at West Warren, Mass., for the purpose of operating a plant on the Quaboag river, which has been idle a number of years.

CINCINNATI MACHINERY MARKET.

CINCINNATI, Feb. 17.—In the machinery trade all lines report that business is as good if not better than it was last year at the same time. The demand comes from all parts of this country, and there are reported some inquiries and a few good orders from abroad. Indeed, appearances are that the foreign business is going to pick up materially. There are indications of improvement abroad and the correspondents of Cincinnati manufacturers talk much more hopefully, unless an exception be made of those in Russia, where they are still of the opinion that tariff difficulties stand in the way of a resumption of active trading.

Machine tool builders are running full forces and many of them have on night shifts. Additions to existing plants are being made or are in contemplation and all are working toward getting in a position to furnish tools on shorter delivery than is now possible. Some of the larger plants have been compelled to sublet considerable business among the smaller concerns.

The Cincinnati Milling Machine Co. reports an order for nine milling machines for R. Hoe & Co., New York, considered quite a significant order for these machines. They run through several sizes, and the order is one of the largest placed for milling machines for some time. This same concern also received a cable order this week from Germany for five milling machines, this order also being significant, coming from a country in which the demand has dropped down to almost nothing in the past year or two. The Cincinnati Milling Machine Co. reports the largest business for February that it has ever had.

An idea of the demand for malleable castings is given by the Haven Malleable Castings Co., which is now sold up for the entire year. If more business is taken care of the company will have to make contemplated additions. The concern cannot run all night on account of the change of patterns among the men, it being all piece-work, but the foundry is run from 4 a. m. until a late quitting time.

A very complete power plant is to be put in by the Baldwin Piano Co., the electrical equipment having been contracted for with the Bullock Electric Mfg. Co. The generator will be a 250-kilowatt machine and there will be 10 to 15 motors for the different larger machines through the factory. The company is going to increase its already large piano manufacturing establishment, hence the need for an entirely new power plant. The engine will be 325-horsepower and will be furnished by the I. & E. Greenwald Co.

The J. A. Fay & Egan Co. has had the most prosperous year in its history and the directors indicated that fact by declaring a dividend of one per cent on the common stock at their meeting last week. The preferred stock has paid 7% a year right along, but the common has not been receiving dividends for some years, it being the policy of the company to accumulate a surplus and make improvements. Common stock dividends will now be declared regularly at the rate of 4 per cent a year.

The Cincinnati Planer Co. is having plans made for an addition to its already large plant on Buck street in the West End. The addition will be an enlargement of the company's machine shop.

Arrangements have been made by the stockholders in the Louis Lipp Co. to incorporate a new foundry company, which shall occupy the present site of the company as soon as the new buildings on the B. & O. S. W. Railway, near Chester Park, are ready for occupancy. The present plant has a foundry in connection with it, in which the company has made its own castings for its bath-tub business. In the new plant there will be a new foundry for taking care of this work, but the old foundry will be increased by the addition of a new cupola and will be devoted to the manufacture of castings for the trade entirely. The foundry will occupy the entire site now covered by the old plant at Fifth and Wayne streets.

The Electric Railway Equipment Co. has secured the contract from the Cincinnati Gas & Electric Co. for the furnishing of 900 large posts for the underground electric street lighting and 3,500 large ornamental brackets for addition lamps in the over-head district of the city. The Safety Insulated Wire & Cable Co. secured the contract for 300,000 feet of cable for the underground work in this same connection.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Carnegie Tube Co., Carnegie, Pa., is in the market for a skelp shear.

Grant C. Nobbs, 2520 to 2522 Smallman St., is in the market for a sheet shear for cutting up to ¼-inch.

The H. N. Straight Manufacturing Co., Kansas City, Mo., whose plant is located in Armourdale, will commence the manufacture of steam engines shortly. A foundry and machine shop, each 100x210 feet, will be erected, and the company is now in the market for foundry equipment and machinery for the machine shop.

The Mackie Steel Tube Manufacturing Co., of Chicago, Ill., has increased its capital stock from $50,000 to $100,000.

The Western Machine Tool Co., of Holland, Mich., has been incorporated with $25,000 capital.

The Madison Av. Foundry, of Cleveland, Ohio, has been incorporated with $20,000 capital to operate a foundry. Fred Metcalf, M. W. Peters, M. W. Merriman, George H. Kelley and George H. Whitcomb are the incorporators.

The Walton Iron Co., of Cincinnati, Ohio, has been incorporated with $50,000 capital.

The Detroit Steel Casting Co., of Detroit, Mich., has been incorporated with $100,000 capital for the purpose of erecting and conducting a steel foundry. H. H. Newberry, T. H. Newberry, J. S. Newberry, DeWitt Loomis, A. W. Atterbury and H. N. Joy are the incorporators.

The Acme Fence and Foundry Co., of New Albany, Ind., has changed its corporate name to the New Albany Stove and Foundry Co., and has increased its capital stock from $10,000 to $15,000. The plant is to be considerably enlarged.

The Boutell Manufacturing Co., of Rochester, N. Y., has been incorporated with $45,000 capital for the purpose of manufacturing machinery. W. H. Boutell, F. F. Church, R. H. Cochrane, F. B. Lease and George W. Hamlin are the incorporators.

William Brenner, connected with the Ohio Rolling Mill at Findlay, Ohio, has decided to erect a large chain plant in the vicinity of his present plant very shortly.

It is reported that Elmer Leach, L. Choate, Frank Percey, C. O. Josslyn and George Hilton are organizing a company with $100,000 capital at Oshkosh, Wis., for the purpose of conducting a malleable iron foundry.

The Smith Palmere Machine Co., of Tyler, Mo., has increased its capitalization from $20,000 to $40,000.

The Phœnix Sewing Machine Co., of Augusta, Me., has been incorporated with $300,000 capital. I. L. Fairbanks and J .Berry are the incorporators.

The McMillan Engine & Machine Co., of Syracuse, N. Y., has been incorporated with $100,000 capital. J. L. McMillan, J. B. Dickson and J. L. Eddy are the incorporators.

The River Falls Manufacturing Co., of River Falls, Wis., has been incorporated with $6,000 capital for the purpose of manufacturing tanks. H. W. Diers, J. Dodge and F. M. White are the incorporators.

The Chicago Nut Co., of Chicago, Ill., has been incorporated with $25,000 capital to manufacture nuts, washers, etc. A. G. Bagley, W. C. Yeatman and C. F. Messinger are the incorporators.

Jackson & Church Co., Saginaw, Mich., advises us that it is in the market for a five-ton traveling crane, 25-ft. span; an air compressor, 150 to 200 cu. ft. capacity; a 50 to 75 h. p., 225-volt generator, with economical engine and five motors.

V. H. Sibille, Sunset, Pa., is in the market for a 150-horsepower engine and boiler.

The Indianapolis Switch & Frog Co., Springfield, O., a part of whose office was damaged by fire Feb. 10, would like to receive catalogues of the various manufacturers of machinery and supplies in its line, the company's files of catalogues having been destroyed.

A dispatch from Toronto, Canada, announces the incorporation of the John Abel Engine & Machine Co., with an authorized capital of $1,000,000, and the following provisional directors: Hon. S. C. Wood, Robert Kilgour, Clarkson Jones, H. P. Dwight, Wilmot D. Matthews, William R. Brock, A. W. Holmsted, James Milne, Thomas A. Rowan, Samuel Barker, and Edward Lyman Goold.

John T. Dale, of Chicago, has purchased the plant of the Southern Foundry & Machine Works, Fredericksburg, Va., and will organize a company to operate the works on a larger scale. New and improved machinery will be installed.

The Standmeyer Car Coupler Co., St. Louis, Mo., has been incorporated with a capital stock of $500,000. The incorporators are A. J. Duffy, A. J. Meir, G. A. Voelker and others.

The Jerseyville Novelty Works, Jerseyville, Ill., has been incorporated with a capital stock of $15,000 to manufacture shaft couplings. G. W. Herdman, G. W. Ware and others are the incorporators.

The Hoopeston Horse Nail Co., Hoopeston, Ill., will spend $50,000 in the erection of a factory building, 50x176.

Henry Freeman, 108 North College street, Nashville, Tenn., is in the market for small-size engine castings.

Capt. W. E. Craighill, United States engineer, 1050 Main street, Wheeling, W. Va., will open bids March 4 for supplying about 7,000 pounds cast iron and about 700 pounds malleable iron; blank forms furnished on application to above or to United States engineer office, Charleston, W. Va.

Ben Catchings, of Birmingham, Ala., will establish a $40,000 rolling mill at Tuscaloosa. It will be a 13-inch mill with a daily capacity of 50 tons and a 500-horsepower engine and boiler equipment.

The Milwaukee Corrugating Co., is the title of a new steel roofing establishment to be located at Milwaukee, Wis. It will be under the direction of Louis J. Kuehn, who has been manager for a number of years of the La Crosse Steel Roofing & Corrugating Co., La Crosse, Wis. The latter company will continue in business under the ownership of John C. & G. F. Korner, who have purchased Mr. Kuehn's interest. The new company will be in operation about March 15.

Fires and Accidents:—

Fire last week destroyed the plant of the Wayne Works Co., Richmond, Ind., manufacturers of agricultural implements. Loss, $75,000; fully insured.

The machine shop and part of the foundry of the Wallace Mfg. Co., Frankfort, Ind., were recently destroyed by fire. The loss will reach $4,000.

A Chicago dispatch of Feb. 6 says the entire plant of the Wireton Heating Co., at Wireton, near Blue Island, was destroyed by fire. The foundry of the company was wrecked and the buildings of the brickyard were destroyed.

At Springfield, Mass., Feb. 16, the factory of the Hampden Corundum Wheel Co. was almost totally destroyed by fire, causing a loss of about $50,000, mostly covered by insurance.

New Construction:—

The Sharon Steel Hoop Co., Sharon, Pa., will erect four open-hearth furnaces with a daily capacity of 300 tons. The raw material for this mill is being supplied by the Sharon Steel Co. at the present time, but upon the completion of the open-hearth plant the hoop mill will be entirely independent so far as steel is concerned.

Mayer & Co., Philadelphia, Pa., will erect a forge and press-room building 36x76 feet. The company is in the market for machinery for this addition.

Alfred Insinger will erect a new machine shop at Wayne Junction, Philadelphia, Pa., which will be 180 feet long, 52 feet wide and three stories high. Bids for machinery for this plant will soon be opened.

It is reported that the Structural Steel Car Co., of Canton, Ohio, will erect an open-hearth plant and a structural mill to supply itself with structural material for its car shops.

The Tidewater Steel Co., Chester, Pa., has broken ground for a new 50-ton open-hearth furnace. The company now has three furnaces in operation and the completion of this furnace will make the fourth.

Messrs. Pierpont and Heaton, Salt Lake, Utah, will erect a new foundry upon the site of the Sun foundry, which will be 35x100 feet. Bids for the erection of the building and for equipment will be opened within the next two or three weeks.

Contracts for the erection of the plant of the Youngstown

Steel Casting Co., Youngstown, Ohio, were awarded last week. The erection of the main structure, a building 200 feet long and 60 feet wide, has been awarded to the Garry Iron & Steel Co., of Cleveland, Ohio. This will have a lean-to 100x35 feet. By the terms of the contract the building is to be completed within 90 days. The S. R. Smythe Engineering Co., of Pittsburg, has the contract for the erection of a 15-ton open-hearth furnace, gas producer and drying and annealing furnaces. The Northern Engineering Works Co., of Detroit, Mich., have been awarded the contract for the installation of one 20-ton and two 5-ton electric traveling cranes. Contracts for the boilers, dynamos and electrical work will be let within a few days.

Plans have been prepared for the new plant of the Bettendorf Steel & Axle & Car Bolster Co., Davenport, Ia., to replace the buildings which were recently destroyed by fire. The main building of the new plant will be 175x500 feet, and will be equipped with modern machinery throughout.

The Marine Iron Works, Chicago, has completed plans for the erection of a two-story machine shop, 40x110, a two-story pipe shop and office building, 50x182, and a two-story boiler shop, 62x64.

It is reported the Sheridan Stove Co., Quincy, Ill., will enlarge its plant to double the present capacity.

The Morden Frog & Crossing Works at South Chicago, Ill., will be enlarged by the addition of a one-story machine shop, 100 feet square.

The Michigan Malleable Iron Co., Detroit, Mich., contemplates an addition to the plant.

The Fountain City Drill Co., La Crosse, Wis., will build an addition 50x100 feet to the foundry, work on which will be commenced in the spring. The warehouse also will probably be enlarged.

The Rochester & Pittsburg Coal & Iron Co., is to build a blast furnace, 80x19 feet, between Falls Creek and DuBois, Pa. Julian Kennedy, of Pittsburg, is consulting engineer.

The recently organized Battle Creek Machine & Foundry Co., Battle Creek, Mich., has secured options on three sites with good railroad facilities; one of these will be purchased shortly and the erection of a machine shop, 40x80 feet, two stories high, and a foundry, 40x80 feet, one story, be commenced. The company, which was organized by Frank E. Halladay and others, will equip the plant with improved machinery, applicable to heavy work.

The Cockshutt Plow Co., Ltd., Brantford, Ont., has increased its capital stock from $250,000 to $750,000, and will practically double the capacity of its plant, by the erection of new buildings and the installation of new machinery.

Reeves & Co., Columbus, Ind., has established a general agency at Oklahoma City, O., and will erect a warehouse there.

Schuttler & Hotz, Chicago, have purchased 16 acres of land on the west side of that city, and will soon begin the construction of a plant for the manufacture of the Schuttler wagon. A company will be organized with a capital stock of $500,000.

The Morden Frog & Crossing Works, South Chicago, Ill., will add a one-story machine shop, 100 feet square, to its plant.

J. L. Rogers, Riverside, Cal., is erecting a machine shop, 25x30 feet and a foundry 25x40 feet. He reports three months work on hand.

The Fort Pitt Bridge Co., of Pittsburg, has secured the contract for constructing the steel buildings of the Norwalk Steel & Iron Co., Norwalk, O. The main building will be 460x100 feet, and the other buildings will aggregate 200x40 feet.

The report is denied that the Cambria Steel Co. is to build another blast furnace at Johnstown, Pa.

The American Hoist & Derrick Co., St. Paul, Minn., has let the contract for the erection of a $10,000 foundry to George J. Grant, of St. Paul.

The St. Louis Steam Forge & Iron Co., St. Louis, Mo., will build a plant in East St. Louis, Ill., for the manufacture of car axles. L. C. McDonald, president of the company, has offices at Main and Miller streets, St. Louis.

George Warrington, of Chicago, is establishing a shipyard and boiler manufacturing plant at the foot of West Wellington street and the North branch of the Chicago river, Chicago. The plant will occupy six acres of land, one acre of which will be under roof. It will be equipped with modern machinery for the construction of steel vessels up to 150 feet long, as well as boilers and special machinery, such as punches, shears, etc. The latter tools will be made from designs and patents owned by Mr. Warrington.

It is reported that several St. Louis and Pittsburg capitalists, represented by John F. Garrett, St. Louis, Mo., are contemplating the erection of a plant in East St. Louis, Ill., for the manufacture of structural steel.

General Industrial Notes:—

Recent improvements to the E. Keeler Co.'s plant at Williamsport, Pa., include new shops for flanging by hydraulic power, new annealing furnaces and an enlargement of sheet iron and erecting shops. The flanging shop is 130x60 feet, sheet iron shop 80x40 feet, and the erecting shop 125x80 feet, all being of brick. The Cleveland Punch & Shear Works Co., of Cleveland, furnished the 10-foot engine-driven bending rolls, which are capable of bending 1-inch plates. The upper roll is 18 inches and the bottom roll 13 inches in diameter. Among other new machines are a Niles electric crane of 50-foot span, an R. D. Wood & Co. universal flanging press, a Bickford radial drill and Curtis Mfg. Co. electric hoists.

Officials of the Irondale Furnace Co., Seattle, Wash., deny that their furnace plant is to be included in the new corporation to be known as the Pacific Steel Co. and incorporated with a capital of $25,000,000.

The main building of the plant of the Knoxville Wheel & Foundry Co., Knoxville, Tenn., has been completed and the installation of machinery has begun.

The plant of the South Pittsburg Stove Works, South Pittsburg, Tenn., will be sold shortly. The cost originally was $250,000.

It is reliably reported that the Rochester Machine Screw Co., Rochester, N. Y., whose plant was recently destroyed by fire, is seeking a location at North Tonawanda, N. Y.

O. M. Sipel, of Philadelphia, Pa., has purchased the entire interest of the firm of Gleason & Bailey at Seneca Falls, N. Y., and a long time lease has been secured on the Seneca Falls Machine Shop and Foundry. In addition to manufacturing pumping machinery the new owner will build small gas engines.

The Vesta furnace at Columbia, Pa., which has been out of blast for the past two years, is being repaired and relined and will be blown in shortly.

At a meeting of the directors of the Reading Iron Co., held last week at Philadelphia, the sum of $25,000 was set aside for the formation of a relief fund for the employes of the Reading Iron Co., of Reading, Pa.

The foundry formerly operated by L. S. Heald & Co., Barre, Mass., and which has been idle for the past two years has been leased by Charles G. Allen & Co. and will be placed in operation shortly.

The Mannesmann Cycle Tube Works, Zylonite (Adams), Mass., are offered to be sold Feb. 20 by Nathaniel S. Smith, trustee. There are 90 acres of land, in addition to the plant, machinery, patent rights, water rights, etc.

A. J. Fisher, 50 So. Clinton street, Chicago, has received an order from the Inland Steel Co., Chicago Heights, Ill., for a 200-cubic foot Fisher air compressor, to be attached tandem to a rolling mill engine, and to be used for pumping an artesian well. He has also received orders for 250-cubic foot Fisher air compressor, to be attached tandem to a 16x24 engine, from J. & A. C. O'Laughlin, Belwood, Ind., to be used in operating rock drills; for 400-cubic foot compressor from Gillen & Gillen Stone Co., Velp, Wis., to be attached tandem to Corliss engine. He shipped last week to A. F. Bartlett & Co., Saginaw, Mich., 200-cubic foot compressor to be attached tandem to Corliss engine and to be used in operating pneumatic tools.

The Keystone Coal & Coke Co., of Greensburg, Pa., with offices at Pittsburg and Philadelphia, was formed last week with a capitalization of $2,500,000. The new company is a consolidation of the Keystone Coal & Coke Co., Greensburg Coal Co., Hempfield Coal Co., Madison Gas Coal Co., Arona Gas Coal Co., Claridge Gas Coal Co., Sewickley Gas Coal Co., and the Carbon Coal Co. The company will own 7,000 acres of coal land.

It is reported that the Sheffield Rolling Mill Co., Sheffield, Ala., contemplates the erection of open hearth steel furnaces in the near future.

Cross Section.

Side Section.

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Live Steam Separators

Have been approved and accepted by many of the most prominent designing and consulting engineers in the United States because they will take water out of steam and keep this water from being picked up again by the purified current, and do this whether the quantity of water coming with the steam is large or small.

As an every-day investment a Separator in a Live Steam Main will pay—for there is economy in using dry steam—to say nothing about the insurance which one of these appliances, if rightly designed, will give on long lines of piping when boilers prime, or when sudden demands are made for steam.

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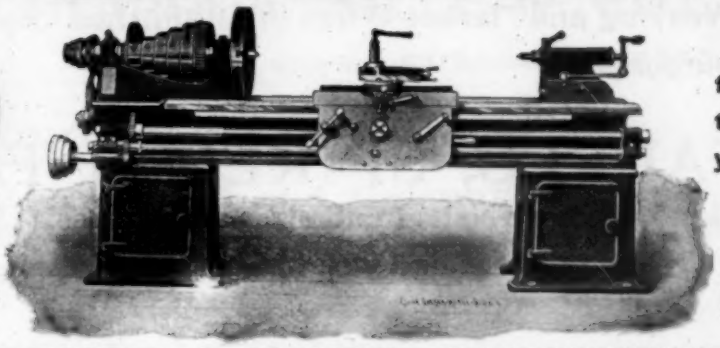

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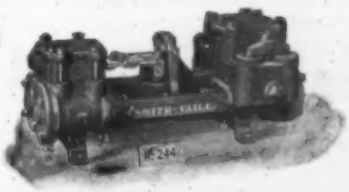
We also build **Single, Duplex and Triplex Boiler Feed Pumps, Steam and Power Pumping Machinery** for all purposes. **Condensers, Air Compressors, Victor Turbine Water Wheels, Oil Mill Machinery and Filter Presses.**



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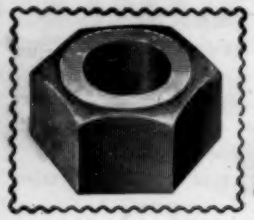

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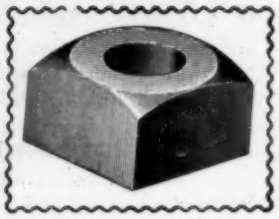

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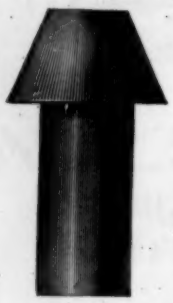

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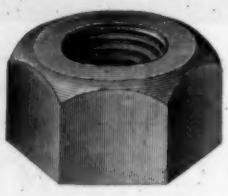

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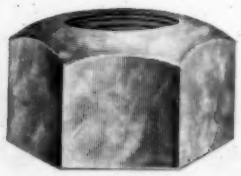

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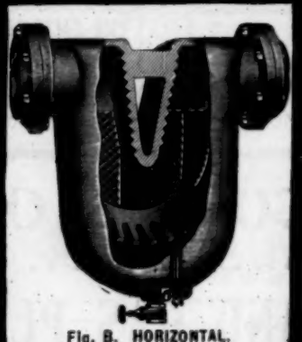

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